doc. 0315

WESTERN WASHINGTON UNIVERSITY 1893

COLLECTIONS MADE BY CHARLES A. ROSS

The following collections were used in Charles A. Ross' 1965 Journal of Paleontology article "Late Pennsylvanian Fusulinidae from the Gaptank Formation, West Texas" vol. 39, p. 1151-1176.

| | | | |
|---|---|---|---|
| Section 26, bed 2 (26-2) | 30-3 | 31-3 | 32-1* |
| 26-8 | 30-6 | 31-8 | 32-11 (2 bags) |
| 26-10B | 30-10 | 31-13 | 32-12 |
| 28-1* | 30-19 | | 32-16 (?3 bags) |
| | | | 32-16 (=7-16-57-loc.7 (not 7-17-59-loc.7 & not 6753 (Leonard?) 6755 |

*Not included in study - probably lacked fusulinids.

| | | |
|---|---|---|
| 34-15 | 36-4 | 37-1 |
| 35-6 | 36-6 | 37-9 (8-20-57; 6683 |
| 35-7 | 36-7 | 37-9 (float) |
| 35-10 | | 37-11 |
| | | 37-12 6683 |

The publication locates the collections quite well. These samples were retained by Charles Ross from the main smaples for future reference. They are part of YPM accession 6683

Charles Ross had a note to me that he was still tracking 37-36b which may be from the lower part of the Hess facies. He was also trying to locate the source of samples 8-31-66-J and 8-31-66-O and -Q; probably southeastern Arizona.

doc 315

doc

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doc. 315

| C.A. Ross 1957, 1958, Measured Sections and Notebook Pages (accn. 6683) | | | | |
|---|---|---|---|---|
| Publ. Sec. # | Doc. 315, pages | Doc. 316, pages | Orig. Field Sec. # | Field Map # |
| 1 | | 5 | 24 | |
| 2 | | 23 | 28 | |
| 3 | | 20 | 27 | |
| 4 | | 12 | 26 | |
| 5 | | 10 | 25 | |
| 6 | 120 | | 18 | |
| 7 | 128 | | 19 | |
| 8 | 7, 8, 135, 143 | 96 | 20 | |
| 9 | 155 | | 21 | |
| 10 (upper part) | | 154 | 42 | |
| 10 (lower part) | | 156 | 43 | |
| 11 | | 159 | 44 | |
| 12 | | 62 | 35 | |
| 13 | | 65, 86 | 36 | |
| 14 | | 69 | 38 | |
| 15 | | 67, 104, 126(not in Pub Sec) | 37 | |
| 16 | | 121 | 40 | |
| 17 | | 72 | 39a, 39b | |
| 18 | | 89 | 41 | |
| 19 | 56, 67 | | 7 (VII) | |
| 20 | 40, 45 | | V | |
| 21 | 49 | | VI (sec 1/2 way bet. V & IV) | |
| 22 | 29, 38 | 32 | IV | |
| 23 | 23 | | III | |
| 24 | 19 | | II | |
| 25 | 16 | | I | |
| 26 | 71 | | 8a, 8b (skeletal) | |
| 27 | 75 | | 9 | |
| 28 | 86 | | 12 | |
| 29 | 76 | 150 | 10 | |
| 30 | 80 | | 11 | |
| 31 | 90 | | 13a, 13b | |
| 32 | 101 | | 15a, 15b | |
| 33 | Udden, 1917, & King, 1931 | | none | |
| 34 | 97 | 163 | 14a, 14b | |
| 35 | | 56 | 33 | |
| 36 | | 39 | 29 | |
| 37 | | 52, 124-127, 169 | 32 | |
| 38 | | 43 | 30 | |
| 39 | | 48 | 31 | |
| 40 | 107 | 137, 140 | 16 | |
| 41 | 114 | | 17 | |
| 42 | | 2 | 23 | |
| 43 | King, 1931 | | none | |
| none | 157 | 129 | 22 (not on publ. Map) | |
| none | | 34, 58 | 34 (not on publ. Map) | |

doc. 0315

C. A. Ross

Peabody Museum
Yale Univ.
New Haven, Conn.

# FIELD NOTES
## Book 1

Marathon, Texas, Summer 1957

Study of Wolfcamp Hills and Wolfcamp sediments along S. front of Glass Mts. –

C.O. Dunbar visited me in the field on the 22, 23, 24, and 25th of June, 1957

Also Gaptank Localities

1665

☐ = thesis +/or publ. sec. #

Doc 315 + 316

doc 315

orig. field
sec. II

I
II
III
IV
V
VI
7 (VII)
8 a, b
9
10
11
12
13 a, b
14
15 a, b
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
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34
35
36
37
38
39 a, b
40
41
42
43
44

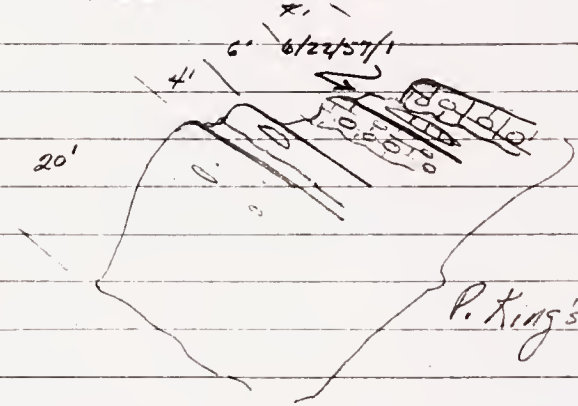
doc. 0315

(Neal) Taylor Ranch - Wolfcamp Hills - Sunny - Warm.

6-22-57

①

Collection - 6-22-57-1 - Upper of P. King bed 2 - point over Geologist Canyon - 200 yds N. of Ute Mites Saddle.




Collection 6-22-57-2 - From about middle of P. King bed 4 - 100 yds east of east turn of creek Geol. Canyon

Hess is a 1s sequence and underlies the Leonard which is siliceous.—
The Leonard just beneath the sill and top of Wolfcamp is Calcarenites, + often very silty — well bed, The Hess Conglo. is "white"
The [illegible] the Wolfcamp looks like a good place to measure the Hess Conglo. and to determine to fusulind sequence in the Lower Hess (or Leonard) — Check this section against the Conglo sequence on the north fork of Geol. Canyon.
Question to think about: what is the nature of the cyclic deposition of the Wolfcamp sequence. The limestones start off with rumble and then go up through clastics which become finer and finally are present as finely laminated sand (siliceous). These lam. are similar to the individual sets of beach deposits in Lyons Sa. What caused cycles? what conditions changed to cause deposition of Hess Conglo. + Leonard silt + clastic beds.
C.O. Dunbar + I drove around east end of Hills and got back side — road not so good. Walked the eastern exposures of the upper Wolfcamp (P.King beds 4 to Hess Conglo.)



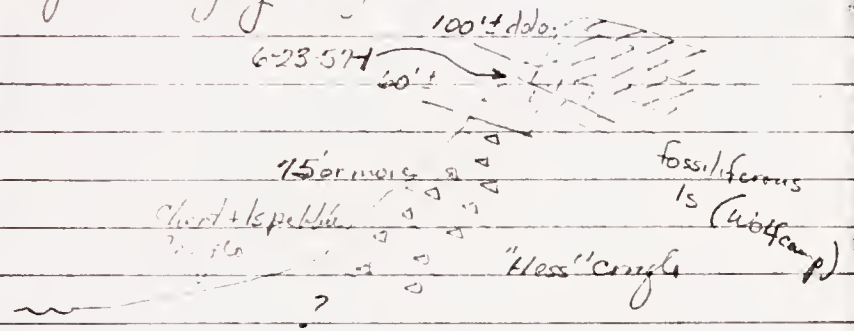
The fauna needs to be studied from various points along the [illegible] bed on the Conglo. exposure.
Reef rocks forms in great abundance on P.K.'s bed 9 to 12 — this cause uneven, distorted, 15 ledges and also result of differential compaction.

Cool in Morning, Sunny, some haze — dusty and hot in afternoon. Regional showers in late afternoon.

(4)

6/23/57 —

Went to Hess Ranch and to spur of ridge around which Road winds — C.O. Dunla. explained section to top of Ridge — roughly as follows:



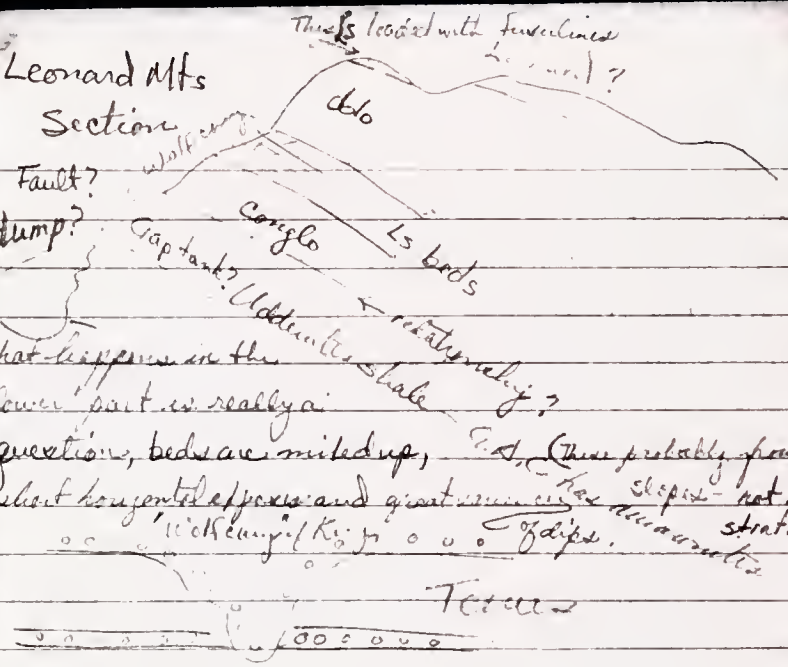

The age of the dolo is questionable — The "Hess" congl. has wolfcamp fusulinas overlying it — so that the congl is apparently one of the wolfcamp series.

The possible correlation of the above section with that of Leonard Mts. needs to be accurately worked out.

6-23-57-1 — Spur above Hess Ranch House — just east of fault, about 15-20 feet below base "the dolo" ledge (about 10' below "rusty" layer).

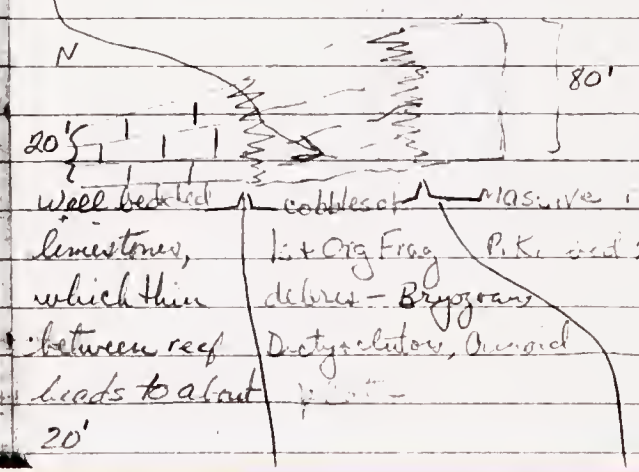
(5)

Leonard Mts Section

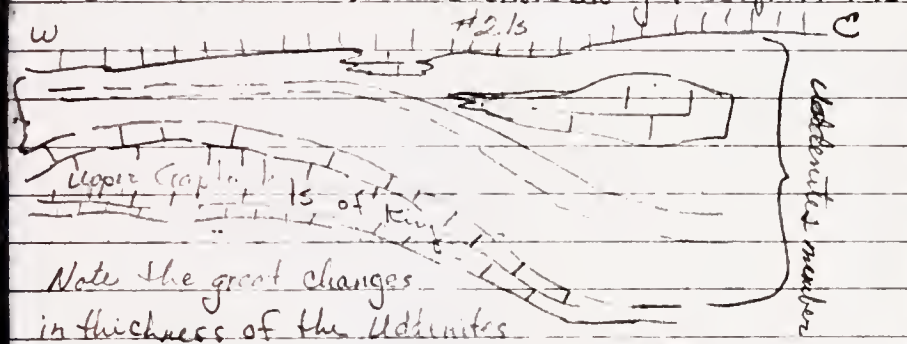



Udomite Shale — east side of geol. canyon 6-23-57-2.

6-23-57-3 — West flank of Main Reef (West) hole in P.K. Limestone 2 due North of Neal Ranch.



Uddenites zone – Brown weathering material in ls – what is it? Section along face of Mid Hills




Note the great changes in thickness of the Uddenites shale – The contorted bedding of the upper Gaptank ls, the biohermal nodules and variation in thickness of other beds – Trace these out and try to find out if the Uddenites member is only a facies, a time units which may have been deposited as the Gaptank was being deposited, time of deformation – what is structure of these? Igneous? What about joints about the draped limestones over the higher biohermal developments?





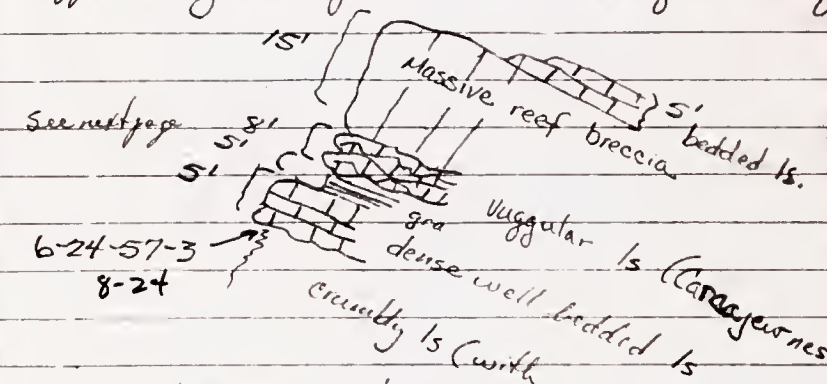
Sect. 8 (part)

6/24/57 [see p. 135 + 143]

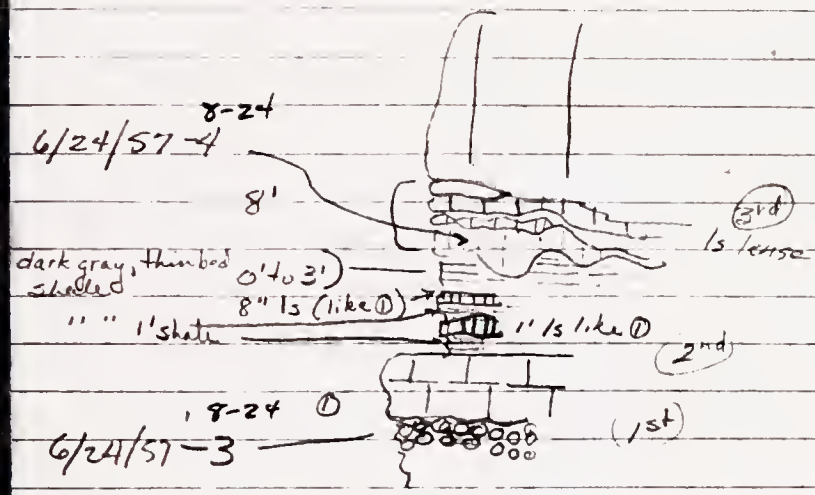
1st limestone ledge about 20' above top of Wolfcamp Congl. in Section Karagwe next in Lewis Hill – ref. C.O.D. 6527/54 collection 8-12

6-24-57-1 is in same horizon as his –

6-24-57-2 – From same section as -1; This is from a large block of ls. 3'x2' in the Hess ledge – The ledge itself is a Sacchinella – Leptodotes reef with sed boulders of various rock types in it. This block from which this sample is taken is apparently on edge in the rubble of this reef.




The exact base of the Hess is questionable here – any of these lower 3 contacts would be acceptable.




① a gray ls with fine to med pebbles, and abundant crinoid stems and shell fragments -

The fusulines in -4 are possibly weathered out from lower bryozoa and redeposited in pockets in the reef facies. C.O.D. believes these are at least numerically similar to those of collection -3

The contact between the massive clay forming and the underlying could be either a cut surface or a squeezed surface - The way the lens ls units in the silt stone lense in front would suggest a facies change and not a great unconformity right at the base of the Hess Lodge.



Collection 6/24/57-5 - at the base of Upper Hess Lodge, 250 yds S of gully 1st heads which flows down Carcajou section. unit 53, Section 8

Collection 6/24/57-6 - a fusiliform 8-37 bryozoa in Hess which is 1/2 way up the (80') above the basal Hess Sacchinella ls. This is interbedded with the siltstone, sandstone ($CaCO_3$) iron-chert-stained-

Collection 6/24/57-7 - slabs of a fusuline & shell crochina - 45' above top of Lower Hess sacchinella ls reef at Carcajou section

(10) Gaptank type area  Clear + Sunny

~~Loc 1~~
6/25/57-1 Collection from a limestone within the upper Gaptank Congl. of P. King on or close by to the type section.

~~Loc 1~~
6/25/57-2 - Collection on back NE slope at top of P. King upper Gaptank congl. cont.

~~Loc 2~~
6/25/57-3 - 10' above collection 2 - 6 or 8 feet of brownish weathering nodular ls with interbedded yellowish shale - beds above are vaudy (brownish-red)

~~Loc 3~~
6/25/57-4 - about 80' above collection 3 In what we believed is P. King's ~~#4 Gaptank ls~~ (this may be his #2 ls here) This is #2! light gray to white ls, with occasional light yellow patches.

~~Loc 4~~
6/25/57-5 - near top of P. King's #3 ls - In one of many gray ls shell checkings. This slope has some coarse fragments within but are incidental in collection

~~Loc 5~~
6/25/57-6 - 10' to 15' below base of P. King's #4 Gaptank ls. - in a brown + gray weathering ls.

(11)

~~Loc 7~~
6/25/57-7 - collection taken at base of what we believed is P. King's #5 gaptank ls. -

Drove C.O. Dunbar to Monahans to get Santa Fe for Dallas.

C.O. D. seemed pretty convinced that the Gaptank is Carson in age and not Cisco. Suggested that Uddenites might be a Cisco equivalent and he said yes that was what the fusulinids seemed to. He didn't know whether the #2 ls of Ferris might not also be Cisco also - The problems of the congloms. pebbles in Cretaceous came up again. This is a good point - Ref. to Cretaceous paper might be good here.

C.O. D. wants more collections from the upper Gaptank - type locality, also a close study of the Wolfcamp and Uddenites zone in that region.

Wolfcamp Hills - east end.

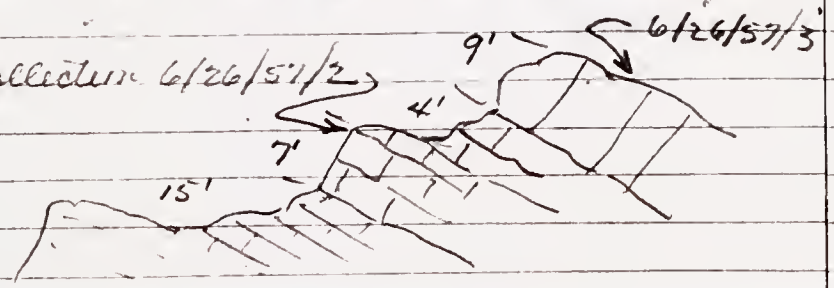
6/26/57 -

Studied the "Dolomite" sequence at east end of the hills - The eastern most ridge is composed of ls, the dolomite if present is limited to one or two narrow bands. The ls is a massive typical biohermal deposit, very large amounts of crinoidal debris and fusulinid shells, a few echinoid spines. Fusulines are few and are smaller than those what are in the 2nd biohermal.

Collection 6/26/57-1 is from a smooth weathering ls band about 8" thick within the upper 2' feet of the massive face forming ls. This is over lain by about 2' of unevenly bedded ls and dolomite. The dip of the massive ls and the unevenly bedded layers is S10E

Much of the slope to the SE of this narrow ridge appears to be rotated and slumped. The dolomitic beds are offset.

Collection 6/26/57/2

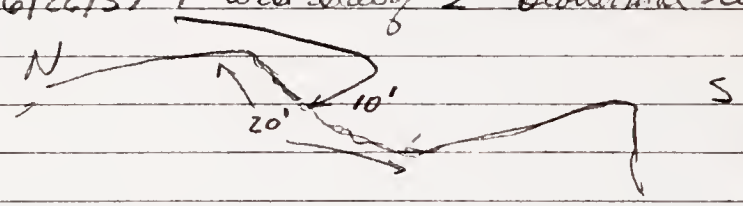




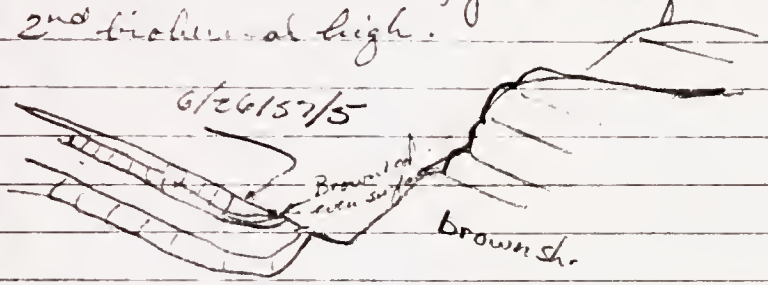

This collection (2) is from the 2nd ls highland from the eastern end of the Hills. The pocket from which these fusulines came is rather thin but of considerable horizontal extent. The stratigraphic interval between 1 & 2 appears to be only about 12' above collection 6/26/57-1, but the relationships are obscured by discontinuous bedding and rubble of these 2 biohermal masses.

6/26/57/3 - From the highest portion of the 2nd biohermal on the east end of the Wolfcamp Hills. This collection is about 13' to 15' feet stratigraphically higher than (2).

6/26/57-4 west side of 2nd biohermal reef.



6/26/57/5 - Collection is from uppermost ls ledge in what will be tentatively called the Uddenites Member, just west of the 2nd bioherm at high.



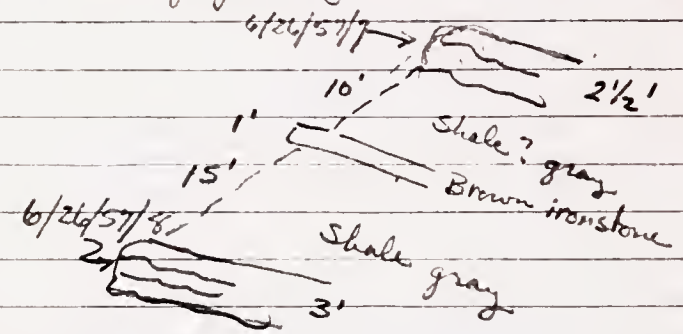

6/26/57/6 - This is collection from a fusuline horizon in brown-yellow weathering band at the base of the apparent upper Uddenites ls bioherm (near the middle of the eastern sector in a wind gap.)

6/26/57/7 Collection from Uddenites zone, 200 yds S of western end of dirt embankment at E end of Wolfcamp Hills. The 2nd ls bioherm of Kin, has beds dipping away and at this point and many blocks of this ls have slipped down to cover the contact. The Uddenites bed is high in the zone and is a gray nodular ls with imbedded brown rust weathering sideritic stones. The calcite in the original rock has been recrystallized, probably as a result of the dioritic intrusion.



flexture at this end of the hills, lowering the eastern end.

6/26/57/8 - Collection from brown weathering brachiopod and fusuline coquina ls, about 25 feet stratigraphically below 6/26/57/7.




The east of the Hills are going to present problems in covered intervals and erratic discontinuous deposition.

Section 25 [25]

(16)

6/27/57 [illegible] miles – (This was one hell of a hot day!)

Measured Section: I Sec 25

S 15E° to [illegible] road at Neal (Taylor) Ranch

S 85E° to [illegible] at tank east of Ranch

Gaptank

1.) Covered below

2.) Ls, weathers yellow to yellow brown, a shell hash of bracketing and fusulina frags; 5½' ; Collection 6/27/57/1 (Bed 1a)

3.) Covered, probably shale which weathers gray brown, 37'

4.) Ls, gray to yellow weathering, lower portion (?) 3 to 4" beds in lobes, upper portion in [illegible] 2 to 4' thick. Thin bands of [illegible] brown shale – 17', organic fragments. Collection 6/27/57/2

Top Gaptank

5.) Covered – 57' probably? Shale with a few [illegible] limestone layers, no definite outlines could be detected

6.) Ls, [illegible] weathering, [illegible] fragments [illegible] pockets of fusulinas are present – 5' the upper portion of this [illegible] has black ls pebbles in it, but have no [illegible]. Collection 6/27/57/3 – one block which contained a good fusuline fauna – maybe [illegible] in the section

(17)

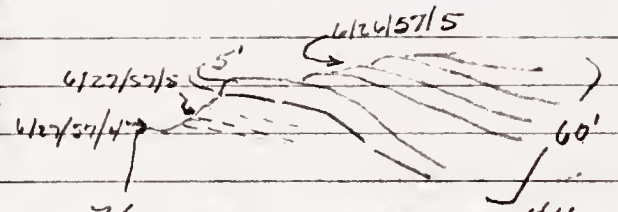
7.) Covered – probably shale 52'

8.) Ls. gray, weathers light brown, lower 11' are rubbly becoming better bedded with undulating 3 to 4" layers: upper 13' massive in 2 to 4' beds, biohermal ls. The shell fragments are dominantly bracketing & crinoids total 24', Collection 6/27/57/4

9.) Covered, 5', probably a weak ls.

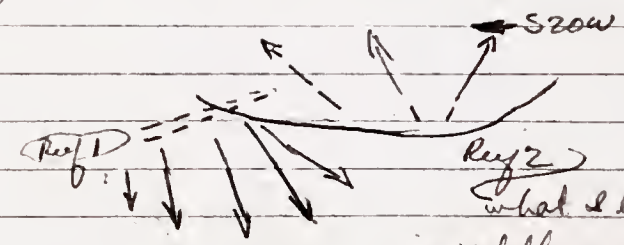
10.) Ls. brown weathering, slightly sandy 7', Collection 6/27/57/5

11.) Ls, gray to brown weathering 5 – 60'




numbers?

The upper surface of this unit has a 1/2" limonite stain on a relatively recent exposed surface –




What I believe is probably equivalent to P. King Bed 2.

The formation of Ref 1 preceed that of Ref 2 and the debris from reef one slaped toward the SE. The relations are not completely clear but the debris from Ref 2 appear to rest on the truncated edges of reef one debris, suggesting that Ref one had a great extent to the NE that was removed before reef 2 came into existence.

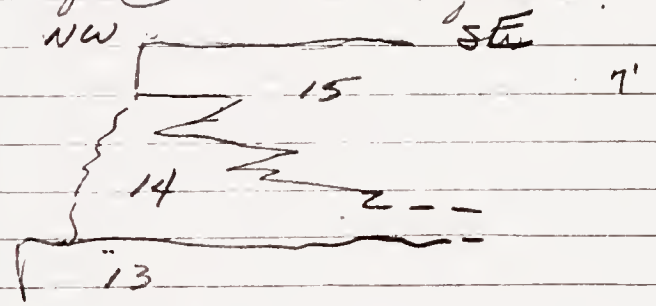
Top of Uddenites 12) Covered 27' probably mostly ls.

13.) Ls. gray weathering, a bioclastal hash. 17', in 4 to 5' massive beds.

#2 ls?

14.) Ls. nodular, dark gray, weathers to white. 5 to 25'

15.) Calcarenite, yellow weathering - Caps (14) but intertongues with it




16) Ls. yellow-buff weathering - 20 ft. collection 6/26/57/4 ile from this interval -

- Top of Ridge -



# Section 24



Section II about 200 yds SW of section I

1.) Shale, dark brown, bottom of interval not seen, top not seen, estimate 100-125' feet thick. Collection 6/27/57/6 [Gaptank shale is considerably thicker here than at type?]

2) Ls, dark gray, ls rubble at base 8', Massive ls ledge 3' (Collection - 6/27/57/7) at 33' above base of 1st ledge - collection 6/27/57/8 #1-28 this unit becomes progressively more shaley in the upper part. Total Thickness of this unit is 74'

3) Ls., gray, brownish yellow weathering - indistinct nodular bedding in lower 8' part of this unit, Collection 6/27/57/9 at base - 33' massive ls with one 2' band of nodular ls about midway in unit - Total thickness 41' - The upper part weathers gray on top.

Top of Gaptank - Base of Uddenites

4.) Covered 12', probably brown shale

5.) Ls, light gray with interbedded brown siltstone - Crinoidal hash. 5' occasional brach. frag.

6) Covered – 9', probably gray shale and a few brown siltstone bands –

7) Ls, brown weathering, bedding 6", uneven surface, Crinoid, bachiopod and a few fusulinas – Collection 6/27/57/10 24.7
8'

8) Covered – 12' probably lime nodules in a clay or silt, some brown colors –

9) Ls, gray, massive –
a) fusulinas and brach cochina in a 6" band at base, Collection 6/27/57/11 (same horizon as 6/26/57/6)
b) Massive ls ledges 4 to 6' thick – These form the dip slope and seem to be about 10' below what I believe is P. King's ls #2 bed.
12' thick (?)



In the afternoon 6/27/56, I drove NE from the wolfcamp hills to a tank (about 1.5 miles). From there I walked slight west north to the Gonzales of the Wolfcamp. Here as mapped by P. King, ~~just below the Hess ledge~~ I found silt and sandstone with even bedding ~~these are~~ exposed in a gully. They would suggest that the single Hess at Wolfcamp hills is only a local bedding. The sandstones are med. lamenlac – 1/8 to 1/16" and have abundant tube (or fecal castings) of worms – one I measured was 5" long, 1/4" in diameter and near straight –

– About 2' above this silt & sandstone sequence – the nubbly part of the ls. I made Collection 6/27/57/12. It looks like what C.O.D. said Scherchubel Ridge would look.

– 4' above collection 6/27/57/12, I found a brown shale – it had a few streaks of red-brown at the top and some gray in patches – Collect 6/27/57/13 from shale.

At this time I'm not too sure of the data, but the deal about shifting and ~~cooking~~ reefs maybe a partial answer to the big picture. Perhaps in well logs we could get the needed 3D perspective on the facies shifts.

After briefly looking at the lower Hess, I wonder at what silt, sandstones, and cemented siltstones, with a few interbedded ls. might mean with relation to the cyclic Wolfcamp and the irregular and peculiar Wolfcamp zone.

The ~~[illegible]~~ phases of the biohermal growth in the Wolfcamp must have had other types of deposits elsewhere - could they not be represented in either the Uddenites facies (no because of fossils?) or the lower Hess (which is not well known faunally)?

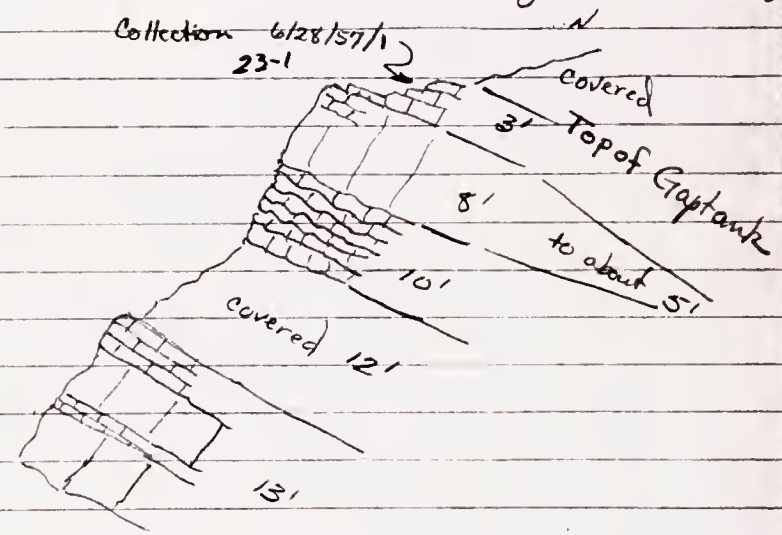
The Hess section I saw in the afternoon needs to be restudied in greater detail. The massive cliff former in the Hill is probably all Hess, but King reports some Wolfcamp and so the face of the hill needs to be studied.



6/28/57 23 Near Center of WCHs —

Section III in a line N30W of Taylor (Neal) Ranch

1.) Upper Gaptank ls - same unit as 3 in section II. Here it is less massive, about 8' feet, with the middle nodular zone of unit 3 in Section II thickening up to at least 10', about 12' more is covered and it looks as if the lower massive zone of unit 3 Sect. II is either missing or is nodular here. The upper 2 to 3' is a nodular ls. in 6 to 8" layers - becomes sandy



2.) 34' covered – probably a gray shale –

3) Ls, brown weathering, gray on fresh surface – This is a organic fragmental rock – of brachiopod and a few coral frags. The lower bedding surface of this unit contained pockets of fusulinids. Collection 6/28/57/2
3'

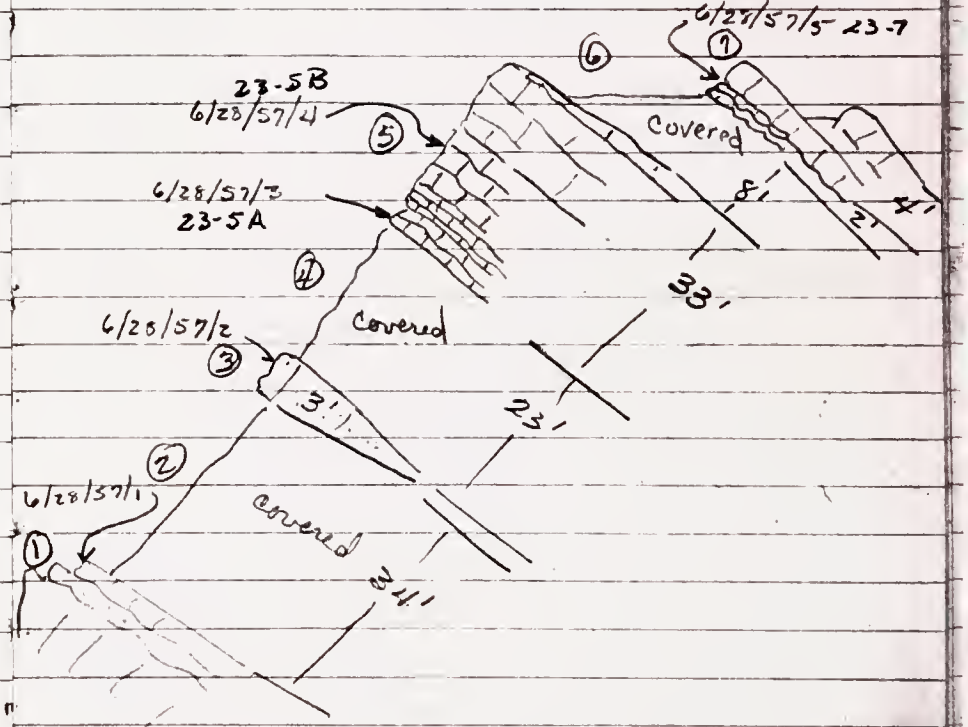
4.) Covered interval – 23'

5.) Ls, yellow brown weathering, in beds 4 to 8", Crinoidal + fusuline cochina here, 50' to the west the unit becomes massive and composed only of crinoidal fragments. Collection 6/28/57/3 is from base of this unit.
Collection 6/28/57/4 taken 20' above base of this unit.
The upper part of this unit becomes massive and is probably a bioherm. It tapers off in both E + W directions into thin beds at the top of the Western bioherm and the beds at the base of the eastern bioherm, 33'

6) Covered – 8' probably gray shale – thickens to 12" but this depends whether it is between biohermes or at the top of one.

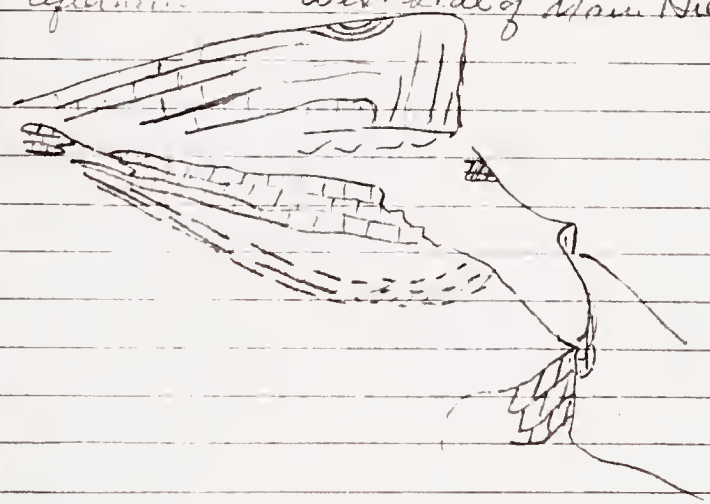


7) Ls, gray weathering, I take this to be the base of P. Kings #2 ls
This is a fine grained calcarenite at this point. The 2 feet of rubbly material below the base of the unit has a fusuline fauna (Collection 6/28/57/5)
4' thickness of unit
– eroded surface –



Collection 6/28/57/6 from a brown weathering biohermal ls. in the Uddenites zone. This is approximately midway between the base of Pilling's #2 ls and the top of the Gaptank ls. –
The Uddenites zone is badly covered here – This section is in line with the road down to the Ranch House S65°E, I estimate the thickness to be 85 to 95' – The outcrop from which collection 6/28/57/6 is about 8'.

afternoon West side of Main Hill





The outward appearance of this is quite misleading. The Gaptank ls forms an anticlinal structure under the western bioherm of the main #2 ledge – The Uddenites zone and a part of the biohermal reef have slipped down on a granite one of the lower Uddenites shale bedding planes. The mass now rests in a structural valley of the Gaptank fm. The eastern side has moved the furthest with about 175' of displacement, the western end is more or less hinged about a point.

Collection 6/28/57/7 – about 6' below top of Gaptank fm – east side of geologists' Canyon –

On the east side of geologists' Canyon, the "window" which C.O.D. pointed out on the first day is most confusing. I have some doubts as to whether it really is a "window" structure. The gaptank does some funny folding at this locality and it seems that the Uddenites zone is missing and the #2 ls of King rests directly on Gaptank ls.

The Udavattes zone as present is only a foot or so thick, but probably is represented by little more than an erosional bedding plane. The fossils present are dominantly crinoids and a few brachiopods and are non-sand chert or silica. This area is quite important and it will pay to study the fauna as carefully as possible to determine age relationships. The Dipsecard questionable faults also may have some importance on the regional structure of the Late Penn.

6/29/57 — Drove to Alpine and got a haircut and the brakes tightened on the car. Did some banking for Mr. Jaffe also.

Sent of 2 bags of rock specimens to Peabody Museum on this date also. Railway Express — COD — 100 lbs total



6/30/57 [See p. 38, + p. 32 of Nb 2]

Geologist Canyon — Section IV

Collection 6/30/57/1 — P. King's gray ls (#2 bed) in creek floor

Covered below

1) Ls, grey-weathering 6" to 3' beds, most crinoidal fragments + some other organic fragmental matter. 31'

The upper portions this unit have progressively larger ls boulders in them. Most of the upper 6 to 7 feet is composed of ls cobbles 3" in dia and ls matrix. The upper most foot contains the large ls cobbles. The few pebbles found on the upper bedding surface are about 1" in diam. (6/30/57/1 is from the lower 3' of this unit.)

Collection 6/30/57/2 is from upper 3' of this unit.

2. 8' Covered — probably gray shale

Collection 7/1/57/10

3.) Ls, congl. 1/2" to 2" diam pebbles, well rounded, with gray chert pebbles — some crinoid stems, a productid — Brown yellow weathering

Collection 6/30/57/3 4'

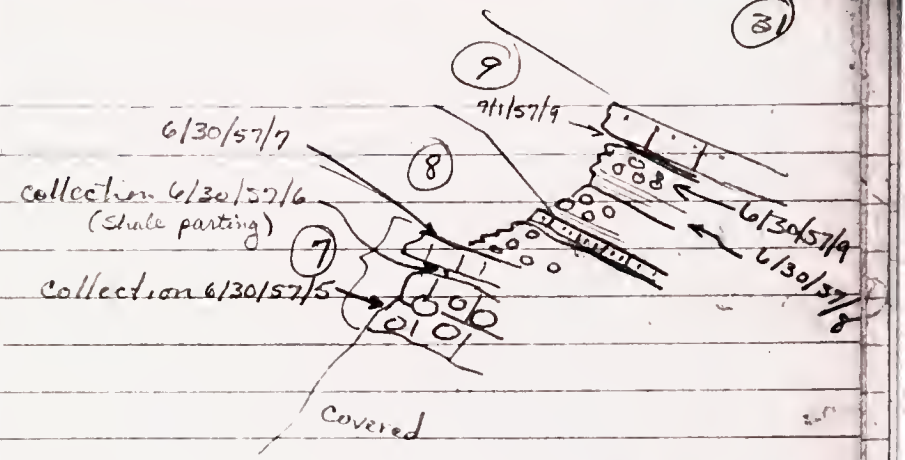
4) Covered 7' black to bluish shale in lower part.

5.) Ls, crinoid yellow-Brown weathering, upper 1' is sandy and organic fragmental. Flat bedding plane on top.
Bryozoans, pelecypods, crinoids common on upper surface. Collection 6/30/57/4
3½'

6) Covered. 44' one or two 4" to 6" brown weathering sandstones are probably interbedded in a shale (gray?)

7) Ls, conglo + rubble at base grading upward into organic fragmental and finally a sand layer (well laminated) in the uppermost 3 to 4". There is apparently a shale parting between the rubble conglo portion and the organic fragmental - sand portion. Typical flat top bedding plane.
(6'?)






8.) 2' - of which the lower 1'8" is a rubble of crinoid parts - upper 3" fine grained, laminated sandstone ($CaCO_3$ + much silification) - a 1" shale parting separates this litho.

9.) a.) shale grey - grading into crinoid clochina and 1" diam pebbles which forms a rubble - 2½'
b.) Repetition of 9a 1½' followed by shale parting 1"
c.) fine cochinia grading upward into a coarse ss, laminated w/ flat upper surface 2'.

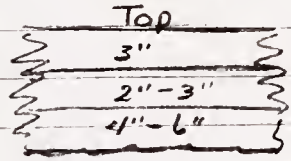
10.) Covered 30' – brown to gray shales probably

11.) Ls, orange brown weathering – another cycle – like units 5 or 7
4' Collection 6/30/57/10 in top portion of unit 11

12.) Covered 13'
b) Have 4" beach sizing covered sizes in ss.
c) 10' covered

13.) Orange brown – calcareous – fine grained planar upper surface – no rubbly 2nd layer observed.

Top of (13) 6/30/57/12

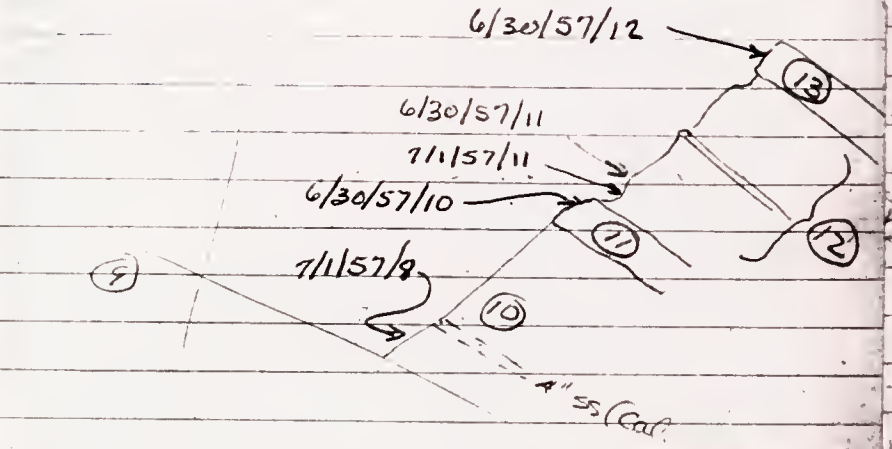


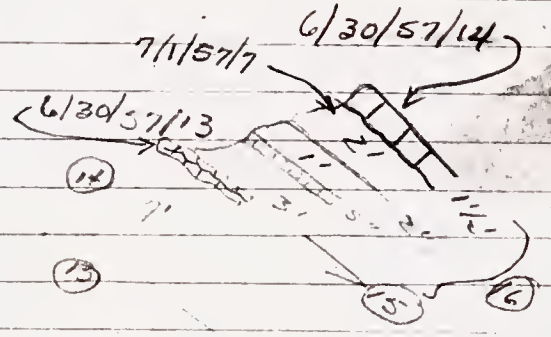

fine ss lamellar
reworked shell zone
lamellar shelly zone

14.) Covered, 4'

15.) Ls, brown-yellow weathering irregular bedding, but with 1" top zone of fine ss nearly planar. 6"





(16) a) 3' gray shale
b.) 5" brown calcarenite bed
c.) 1' gray shale
d. 2" brown calcarenite bed
e.) 2' gray shale
f.) 1½' calcarenite sandstone
This is a typical top sand and rubble Ls –

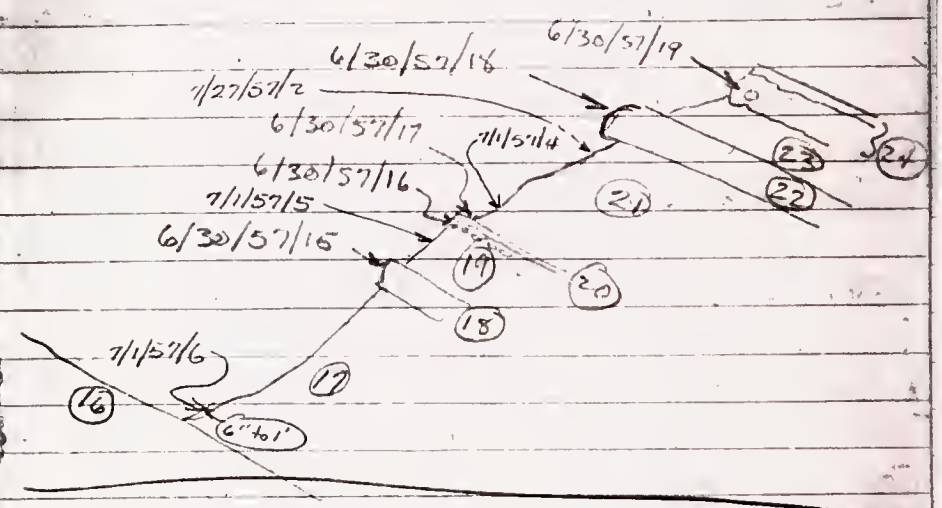
17.) Covered – 25' gray shale?

18.) Ls., the typical planar top surface and shell coquina below – 2' total
Collection 6/30/57/15

19.) Covered 7' shale?

20.) Ls w/ some chert pebbles – Brown weathering and not or yellowish as most:
A coquina (pebble) at base of this is.
Collection 6/30/57/16 (6")
The fine grained, sand (calcarenite) is Collection 6/30/57/17 (4")






21.) 17' covered, shale with thin laminated sells & sandstone –

22.) Ls, yellow-brown – fairly massive – 2' to 3' thick. Some 1" diam. pebbles (mostly black Ls.) Collection 6/30/57/15

23.) Covered – probably gray shale – 8'

24) Ls, brown-yellow, one of the cyclic type – lower rubble zone is 3' upper planar zone (5') is 6"
Collection 6/30/57/19

25. a) Covered 16'.
b) brown ss much like 12b, w/some ironstone crinoidal debris.
c) Shale 12', w/ one 3" brown ss band like 20

26) Ls, brownish weathering, shale beneath - 1½', sample 6/30/57/20

27) Shale, covered in part, 31

28.) Ls, orange brown, few fossils 1½'

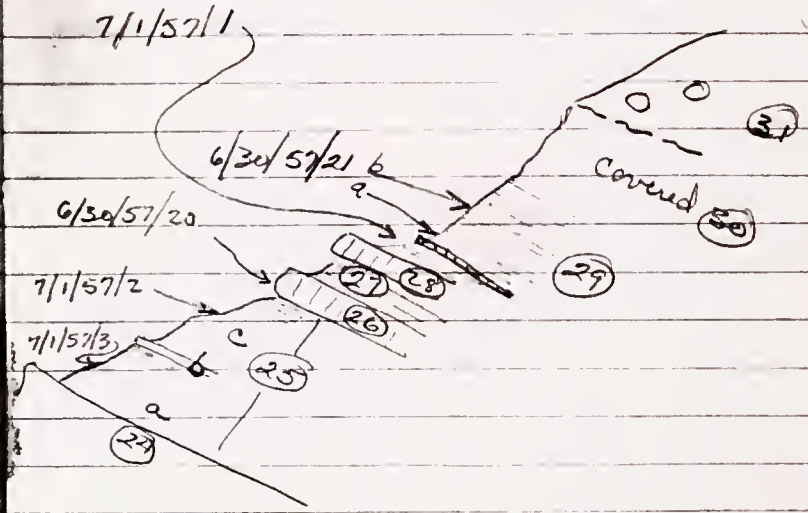
29.) Shale, yellow to orange with a few siltstone layers. - 22'
Collection 6/30/57/21 (a+b) 2 sacks
Brown weathering ls - sand near base

30) Covered 11' probably more of 29 shale
±266'

31.) Hess Congl.

Continued, Pg. 32





7/1/57 — [see p. 29 & p. 32 of Nb 2]

Took shale samples from Section IV

7/1/57/1 to 7/1/57/11 as marked on Section IV

7/1/57/12 in Lower 20' of Lead Hess Trench, on creek — geochemist. These are [illegible] in determining source.

7/1/57/13 Sample of Coyote Hess, upper 10' —

The Hess Coyote is about 35' to 40' thick here.



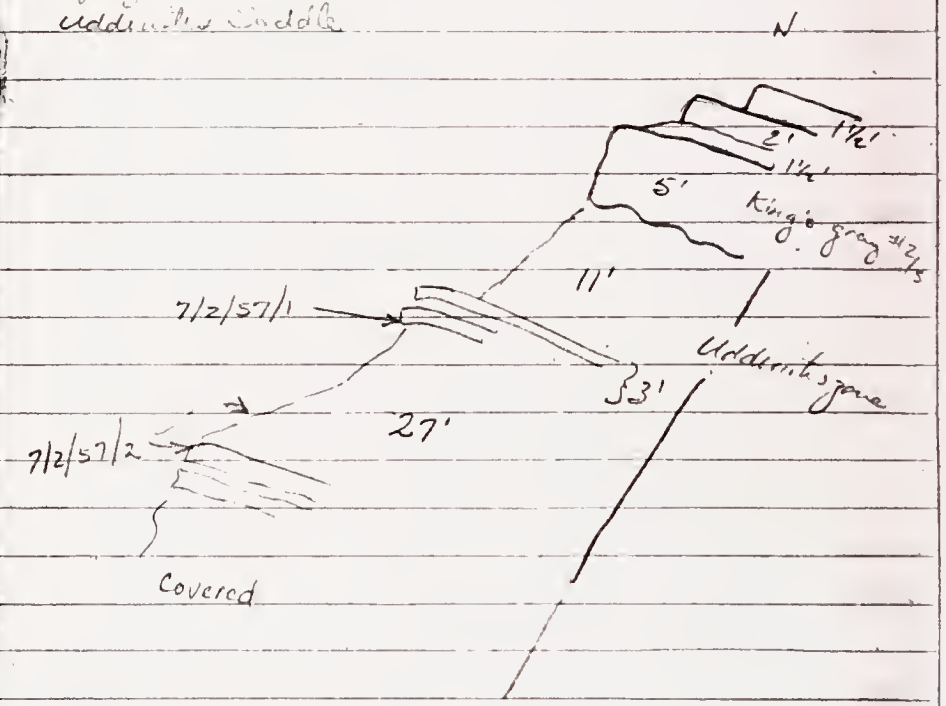
7/2/57

Mr. James [illegible] to [illegible] feet with me

Looked over lower [illegible] West file of WCHs.

Mr. James spotted a fault? on west of WCHs [illegible] Cockerey [illegible] dip to [illegible]

Uddenite Saddle



Section V West end of the WCHS proper - Measured N20W from outlier

Below covered by outwash - Udden's zone probably.

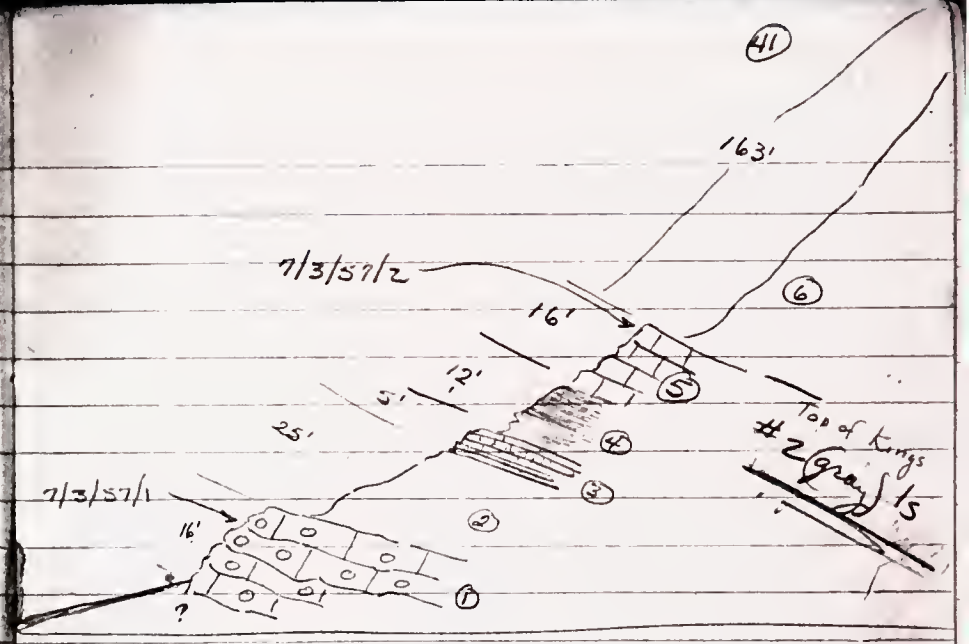
1.) Ls, congl, w/ crinoid + brach frags., Congl cobbles 1" to 4" diam. 16', gray outcrop - top surface is near flat, has an inch gen weathered brown. Many of the crinoid stems are relatively unbroken and probably have had a great deal of erosional transport.

2.) Covered, 25' - seems to be an interval of gray shale & brown weathering calcarenite.

3.) Calcarenite - Brown weathering, cover surfaces appear to be disgorited ss. The upper surfaces are finely laminated - 4" to 6" beds of ss. with interbedded silts + clays. 5'

4.) Shale, blue gray - in part covered 12'

5.) Ls, similar to #1 below, pebbles are ½" in diameter however; Near top is a good fusulina zone - This horizon divides vertically to the west. The upper part forming Kingsland "4" 16'

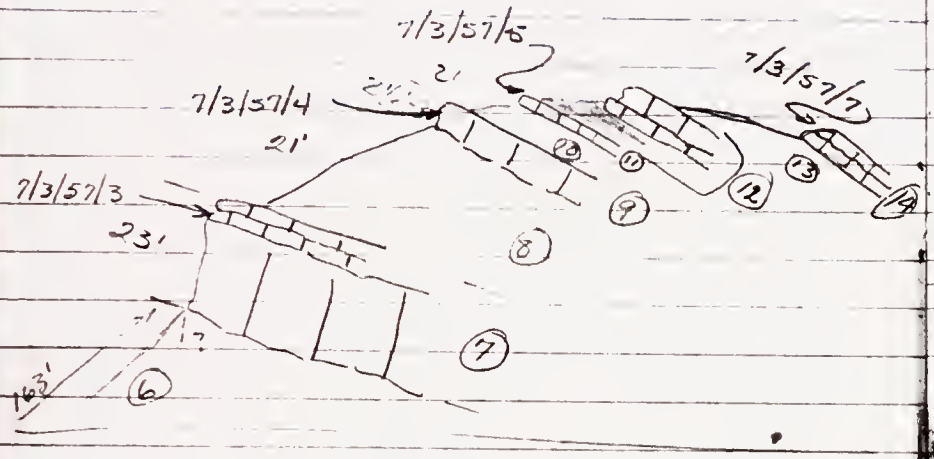



6.) Covered, 163' - How many beds are covered here is only guesswork - The value of this interval is of comparative properties only.

7.) Ls., massive gray weathering, a shell hash which shows very little transportation. Corals, (long slender tetracorals), bryozoans, isolated fusulinas, brachiopods, crinoid stems. Lower 18' massive - upper 5' in 6" to 1' beds.
7/3/57/3 total 23'

8.) Covered, 21' - shale?

9.) Ls, blocky - yellow brown weathering, 6" to 1' beds, 2½' to 3'? - Can't see any bed rock, top is planar, but lacks fossiliferous upper 2 or 3'. Shell hash.




10.) Covered 2'

11) Ls., same as (9), 8" to 12"

12.) a, shale? 6" to 1'
b) pebbly, conglomeratic (½" to 1" pebbles) organic frag. Ls. 2' (silicified fossils common)
c.) Ls, coarse & sizc organic frag. even top bedding surface 2'.

The beds above (17) form irregular steps on the dip slope to the NNW. Brotherwood deposits cover the irregularities in the 6" to 2' ft. beds — 15' to 20' of strata on the dip slope of this ridge which are above bed (12), and not covered by alluvium.



Fault strikes N 15 W 25' strat displacement east apparently downed. This fault is 100 yds± east of section 5.

This afternoon I tried to trace bed 11, section IV around to section I. Bed 11 is eroded away about in line with place where the lower part of section gets mixed up at the first turn in Goal Canyon. The upper surface of bed 11 is nearly completely covered w/ fusulines — The next lower Ls cochina in Sect. IV, bed 9, I don't believe has this great population of fusulines. After losing bed 11, I drop down to what I believe is bed 9, at least the stratigraphic interval is about right. — Then to bed 8? — back to 9? then a bicherval Ls., then a crinoidal Ls, finally to a bryozoan a reasonable number of fusulines !!? about 300 yds from where I first lost 11. If this bed is #11 of section IV then it is about 15' to 20' higher with 2 additional Ls inbetween, perhaps several more. (ie, a chert separating 2 drab vuggy zones, caped by a Ls.)

13.) Covered 4'

14) Ls, brown yellow weathering, silicified fusulines & gastropods, some echinoid? spines

This unit (14) is what I believe is equivalent in lithologic connection to bed 11, section IV.





7/3/57

Morning went to Alpine to see about some photographs; SCS didn't have very good ones, so sent for U.S.G.S. photos —

Sampled from section V

7/3/57/8 — a rock sample from about 100 yds east of section V, from the third unit: at this point unit 3 is dipping 26° S45W. It is truncated by unit 5 which is dipping about 10° N45W.

7/3/57/9 — from Ordovician gamma west side of Geologist Canyon, loose specimens — I believe the gamma is fairly high, pure, pods also —

7/3/57/10 — from top of #2 ls outlier — on dip slope —

7/3/57/11 — from top of a ls in Geol. Canyon. The question is if this is a Caballo ls then it would appear the #2 gray member of King is not present but as much more than rubble at the base of the "4 bed. This is the first ls going up stream after the creek makes the sharp curve to the East

The [illegible] on the rather flat top of the Gray Ls outline [illegible] pretty well [illegible] the [illegible] gray [illegible] above the Canyon [illegible] position [illegible] seems to be very good. I personally believe a discontinuity [illegible] explain as slippage on the shale [illegible] zone [illegible] the Gray Ls [illegible] seem. This viewed to be the result of a syncline in the equal Gaptank beds which in turn and fit case on p. 26 happily control the placement of Lower. The Gray Ls may [illegible] the event, or the event may change lithology a bit [illegible] Believe it is [illegible], paleo will be used to check this. If the #1 bed of section I is Gaptank and the [illegible] would fit nicely as the [illegible] zone. It would seem [illegible] top of the Gray Ls outlier [illegible] that bed 4 [illegible] is fairly constant interval with bed 5 of section G. I would put this at about 10' to 12' or just about the displacement of the Gold N-S fault.



If the fault up Geologist Canyon is for real, the correction from 2/3/27/11 should be Gaptank; I suspect however it will be found to be [illegible]. If it is Gaptank [illegible] can be easily explained as a bed truncated by the rocky beds of the #2 gray Ls above and then by the #4 bed of key near the [illegible]. At this time it seems [illegible] that the large central part of [illegible] are [illegible] and are near the top of the Gaptank [illegible]. The Udden's [illegible] the outlier suggests it [illegible] could be a [illegible] or at least a high area.

The fossils I found today in the Udden zone [illegible] show deposition. The wood in all probably is too common to have been carried any far to sea, the pelecypods are small but [illegible] Canyon type judging by the [illegible] [illegible] of the internal casts. The gastropods may suggest normal marine [illegible] but these point will require further checking.

The question of structural warping of the Ls in the outline of Gray Ls

mbrid [illegible] [illegible] I think that the [illegible] two reef heads which [illegible] the area [illegible] then by debris from [illegible] [illegible]. The nearly [illegible] [illegible] with 2 or 3' [illegible] [illegible] standing nearly the [illegible] with the outlier showed [illegible] against this. The collection [illegible] (7/3/57/10) I believe indicate [illegible] less turbid water (deeper?) giving these [illegible] shell fragments a chance to accumulate in [illegible] [illegible] strata.

Photo [illegible] 4[illegible] [illegible] the [illegible] of the smaller gastropod [illegible] [illegible] the stringed [illegible].

Photo [illegible] [illegible] the [illegible] part of the [illegible] [illegible] in the [illegible] [illegible].

July 4, 1957 – [illegible] marathon!

7/5/57

Sect. 21

Section VI – about halfway between section V + IV.

1.) LS, gray, massives in 3 to 5' beds, conglomeratic on the upper surface, but only slightly. Base of unit not covered.

2.) Covered 6' – stream bed.

3.) LS, yellow brown weathering, organic frag (crinoid, fusulines) medium quartz sand on upper surface, well rounded, but not frosted, 2', upper surface is flat. 7/5/57/1

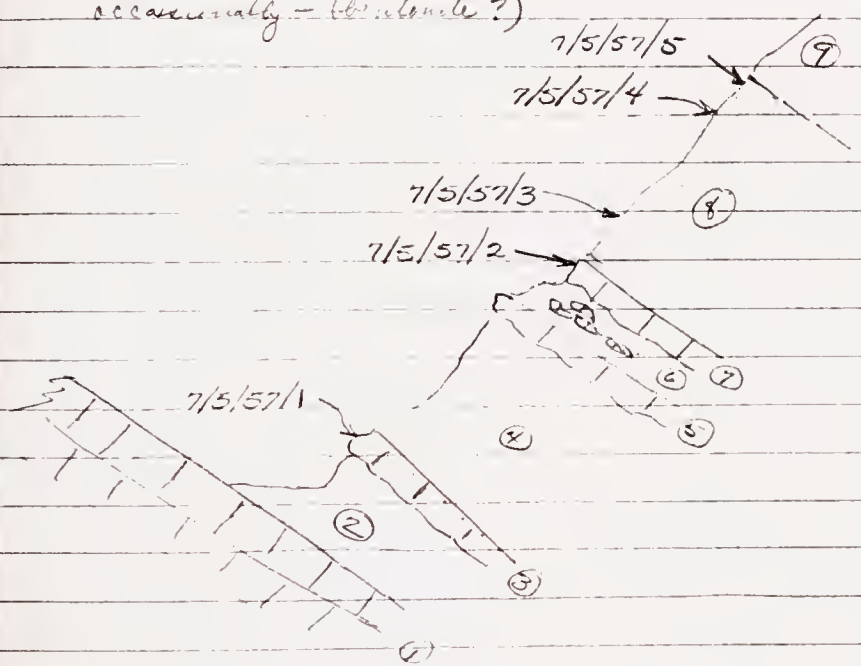
4.) Covered 16' – probably a shale interval with at least one perhaps more modular LS rubble beds.

5.) LS, yellow brown weathering, gray fresh, organic frag. (fusulines, crinoid) replacement quartz in geodes, quartz on upper surface. The quartz sand seems to have been washed across the LS and some quartz stuck to the LS surface – fusulines are bedded in this SS layer. 1'

6) Covered 3', probably gray shale & ls rubble

7) Ls, brown gray fresh surface, orange-brown weathering, shell hash & crinoids, fusulines, bryozoans, progressively finer grained upwards. Upper surface is flat 1' 7/5/57/2

8) Shale, blk to blue, slightly silty, has slight fetid odor. 35', brown and varegated silt zones 1" occasionally – (bentonite?)






9) Covered. 53'

10.) Ls, yellow-brown weathering, (gray fresh) organic frag. (crinoid) – I'm not sure this unit is not changed down from above. 3'

11.) Covered, probably shale in great part. a lot of ls rubble in upper part – 37'

12) Calcarenite, Brown-yellow-weathering; some sand (quartz) and upper surface loaded w/ fusulines, but seem restricted to upper 1" 2½'

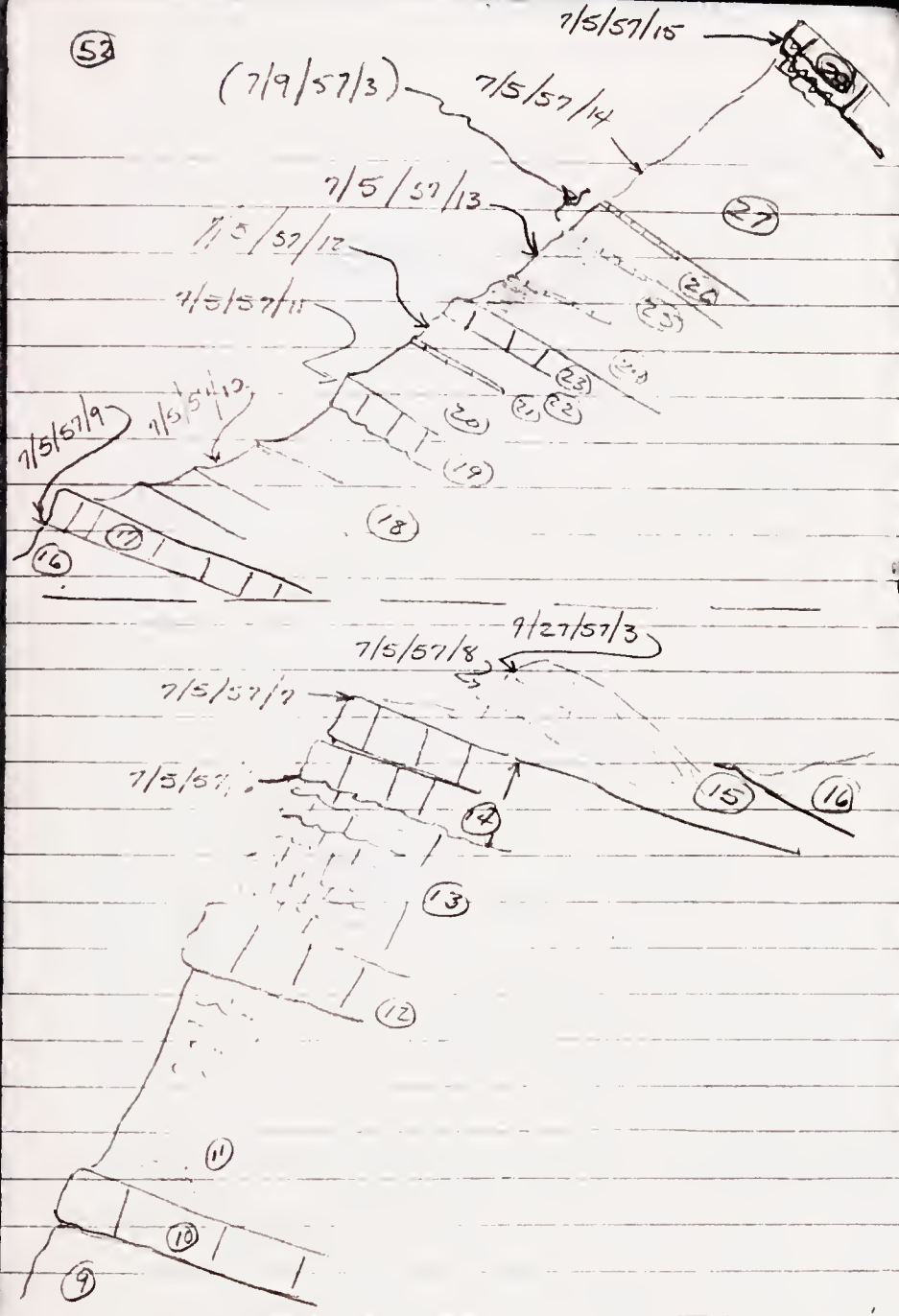
13) Ls, rubble for most part, pretty badly covered and it is possible that there are several shale intervals. 26'

14.) Ls,

a) Calcarenite, brown-yellow weathering; med sand size through out 2½ to 3½', flat top

b) shale parting 2" to 3", gray shale

c) Ls, conglo at base grading up to coarse sand sizes, organic frag. Crinoids brachiopods, corals, bryozoans, 5½'






15.) Biohermal rubble — lower few inches maybe shaly and then rubbly ls., great part is ls, gray, (weathering - yellow buff). corals, bryozoa, sponges(?), fusulines
10'

16.) Covered 14' on dip slope of 15 + 14

17.) Ls, fine pebble conglo., organic frag. of which fusulines seem to dominate, bryozoa
3', fine grained near top, flat upper surface,

18.) a.) covered 4', probably gray shale
b) 4" brown weathering calcarenite + sand (quartz)
c) gray shale 6'
d.) 2" orange-brown silty calcarenite
e) 6' gray shale
f) 3" bed like b.
g) covered 7', gray shale probably.

19.) Ls, orange brown weathering, congl (ls) in part, pebble to coarse sand in top 6", more yellow and rubbly near bottom 3'
Organic fragments: Quartz sand on upper flat surface, scattered fusulines also.

20.) Covered 10' (shale probably)

21.) 4" to 8" brown (orangish) calcarenite w/quartz

22.) 5' Covered (shale probably)

23.) Ls, calcarenite, mid to fine, progressively to top. The upper 5" are well laminated, flat top, 1'

24.) a) Shale, reddish-brown 3'
b) 1" limonite-bedded calcarenite silt-stone well laminated, very fine quartz sand also

25.) a) Shale, gray 5'
b) 1" calcarenite some quartz very fine to fine grained

26.) a) Shale, gray 4½'
b) 6"; like (25 b)

27.) Covered – 30' probably shale and at least 2 calcarenite beds



28.) Calcarenite, rubbly on lower 1½' feet, organic frag.; become progressively better laminated in upper 6", flat top surface, 2', some quartz v. fine sand size on top surface

29.) Covered 41', several calcarenites with gray shale probably

30.) Calcarenite, organic frag. (bracks, pelecypods, crinoids) 10" flat surface not striking on this bed; wood fragments
Collection 7/5/57/16

31.) Covered 18' – probably gray shale –

32.) Marl, silt & clay in matrix and as coarse sand fractions. Has a well laminated upper 2" with flat top. Sort of a transition between influence of semi-arc environment & deposition? 2'
Collection 7/5/57/17

33.) Covered 31'

34.) "Hess" Coyle 30' +

(59) **19** Section 19

[see p. 67]

7/6/57 [VII]

Section 7 — low hill to west of Wolfe Creek hill. The line of section runs due north.

Covered below

1.) Calcarenite, pebbles 1½" to 2" max., calcareous sand + silt + clay + some fossils. Fossiliferous (Crinoids + corals), bedding 1' to 1½' feet. Flat top 4½' gray fresh, light yellow brown weathering

2.) Covered 2½' probably shale or weakly cemented rubble

3.) Calcarenite, w/ a few small pebbles, fossiliferous (brachs + crinoids) common. Quartz sands in up part, 18", flat top. yellowish brown weathering

4.) Covered 11', fossiliferous shale + 1 or 2 calcarenite beds (less than 4 to 6" thick).

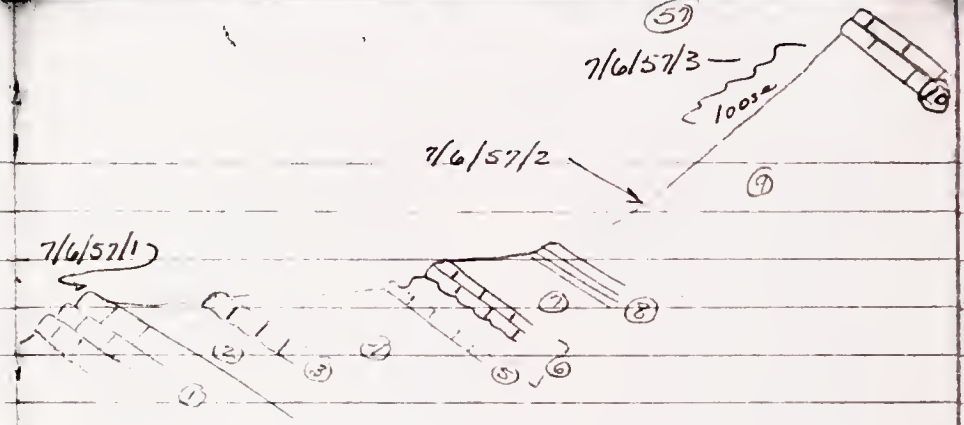
5.) Covered [illegible], brown weathering, some quartz sand 8" [illegible]

(57)

7/6/57/3 — 100 ft

7/6/57/2

7/6/57/1




6.) Calcarenite, gray brown weathering, shell hash, fossiliferous, crinoids + tracks. Lower part of unit is a shale which grades into a ls rubble, then into a well sorted frag. ls. Upper surface is planed flat. Total 5'

7.) Covered 8' — gray shale + some silty calcarenite

8.) Calcarenite well graded med sand, a few fossiliferous (small) and thin parts of crinoids — some of beds in a 4' interval

9.) Covered 70'. The lower 20 feet is probably mostly blue-gray shale. The upper 15' probably mostly ls rubble.

10) Calc. white, 2" diam pebbles, some crinoids & bryozoans, a few gastropods, brown weathering, gray on fresh surface. 4'

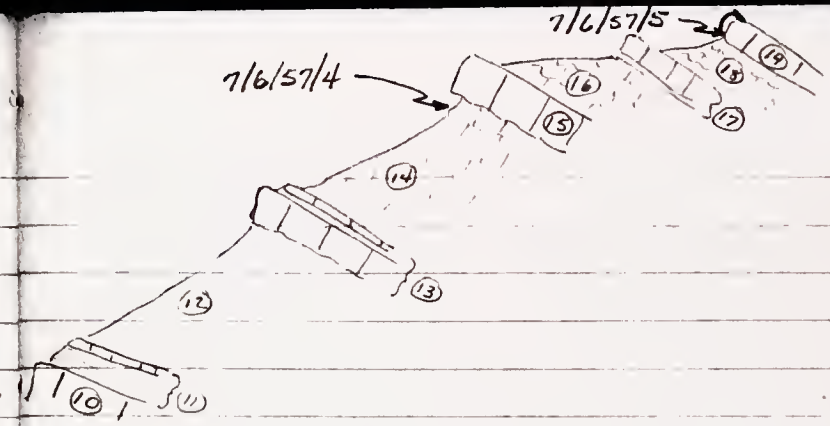
11.) a) shale [illegible] - 1'
b) 4 to 6" [illegible] Calcarenite, [illegible] upper 2' [illegible]
total 1½'

12.) Covered 24' - probably shale (gray) - 1 or more brown calcarenite maybe present.

13) Calcarenite, brown weathering, lower part a shale wash, a shale bed and then the wall is 4" to 8" calcarenite laminated [illegible] total for unit, 4½'

14) Calcarenite, (Ls. rubble) [The main difference between the so called "rubble" and what I've been calling Ls conglom. or calcarenite seems to be the cementing material. In the "rubbles" the cement is clay & weathers to a yellow or yellow-brown] Gray & mottled brown weathering. 18' in 6" to 18" beds.






15.) Calcarenite, brown weathering, frags on lower part fine pebbles to coarse sand size, progressively finer toward top - end sand size at top, no apparent lamination. 3½'

16) same as (15), 5½'

17.) 3' shale break
1½' of calcarenite like (15)

18.) like (14), 4'

19.) like (10), 1½' but pebbles 1" to 1½" diam

20.) Mostly covered, 7', at least 3 4" brown weathering Calcarenite, the rest is probable gray shale.

21.) like (19). the upper ½' is well cemented, has some blk chert in seams ∥ to bedding 1½'

22.) Calcarenite and gray shale - 3 6" to 1' calcarenite brown weathering. Crinoidal & fusulina fragments 4 gray shales 1' to 1½ total 11'

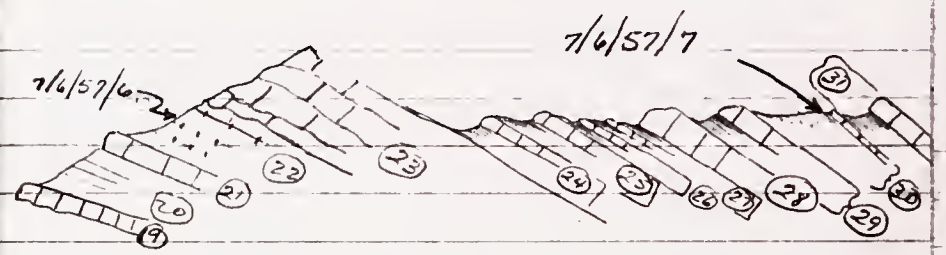
23.) Ls., gray weathering, bedded, very. 17' upper part is crudely bedded in 2' units lower part is rubble.

24.) a.) 2½' gray shale
b.) ½' calcarenite, brown weathering (like (15))

25.) like (24) a.) 1½'
b.) 1'

26.) like (24) a.) 6"
b.) 6" to 2" thins to east






(27) as (24) a.) 1½'
b.) 8" to 4"

28.) Calcarenite - Cover 1' rubble as (14), but 2' as (15).

29.) as (24) a.) 1½'
b.) 2½

30.) as (24) a.) 4'
b.) 6"

31.) as (24) a.) 2'
b.) 2½'

32.) Shale gray, 5½', 2 calcarenite bands, 2" to 4" thick, fine grained

33.) as (15) 2½'

34.) a.) shale, gray 4" to 8"
b.) gray ls, shell breccia calcarenite 6" to 1'

35.) 6½' - like (14) lower 5', like (5) upper 1½'

36.) shale gray, mostly covered [4']

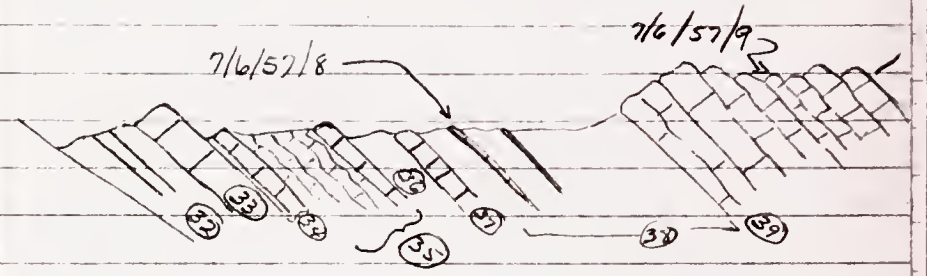
37.) Calcarenite orange brown upper surface, flat 1'

38.) Mostly covered, a 4" calcarenite bed at 4' and 10' are exposed
32'

39.) Calcarenite "rubble" block of gray ls 6" diam brown mottled zones with crinoids + fusulines in them. beds 1 to 3', occasional evidence of the beds being well sorted and [illegible] at top 2 observations



of this feature. 27'




40.) Covered 11' probably less resistant ls. rubble

41.) like (39) 26' The calcarenite making the top bed in this sequence is well sorted and bedded, well cemented, flat top.

42.) Covered 20'

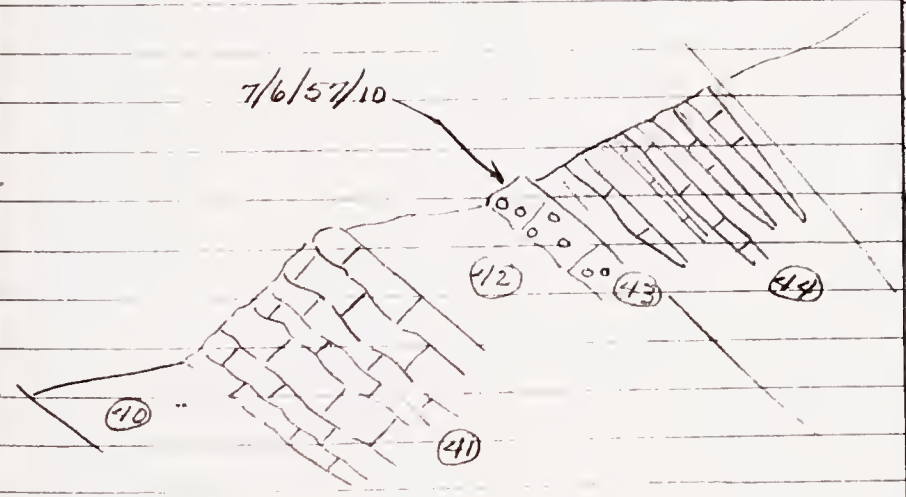
43.) Calcarenite, well cemented, yellow-brown, 1½" diam pebbles, becoming fine grained in upper 3" flat upper surface.
3½'

44.) 16', lenticular calcarenites, These are interbedded with shales, 50 yds to west I could find only 3 or 4 relatively thin beds

45.) Covered. 64'

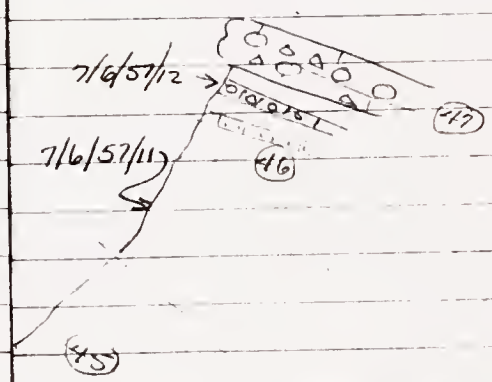
46.) Gray shales - [illegible] interbedded orange & brown sandy siltstones. 53' covered to a large extent -

47.) "Hess" Congl. 8', Calcarenite with a large number of dark chert & quartzite pebbles 1" to 5" diam.






Collection 7/6/57/12 from a yellow weathering congl. about 6' below bed 47 - It seems to differ from bed 47 in yellow color and that about all. 2-3'



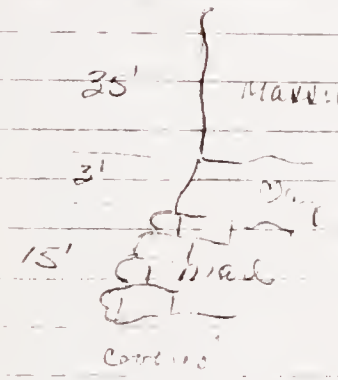

The zone of biohermal ls, #23, seems to carry through pretty well.
I believe that #23, section III, is equivalent to #15, section VI, and to #7, section V.

7/7/57 Big Bend Park.

The first collection is [illegible] same horizon as in the John Wilson Cousin Dillon exhibit just to give reader a park HQs

7/7/57/1 [illegible] a few 10's of feet above the upper contact.

7/7/57/2 along [illegible] Ck, Terlingua Quad. [illegible] 32' [illegible] Wolfcamp








7/9/57
7/8/57 [see p. 56]
Wolfcamp Hills Continuation of Section III

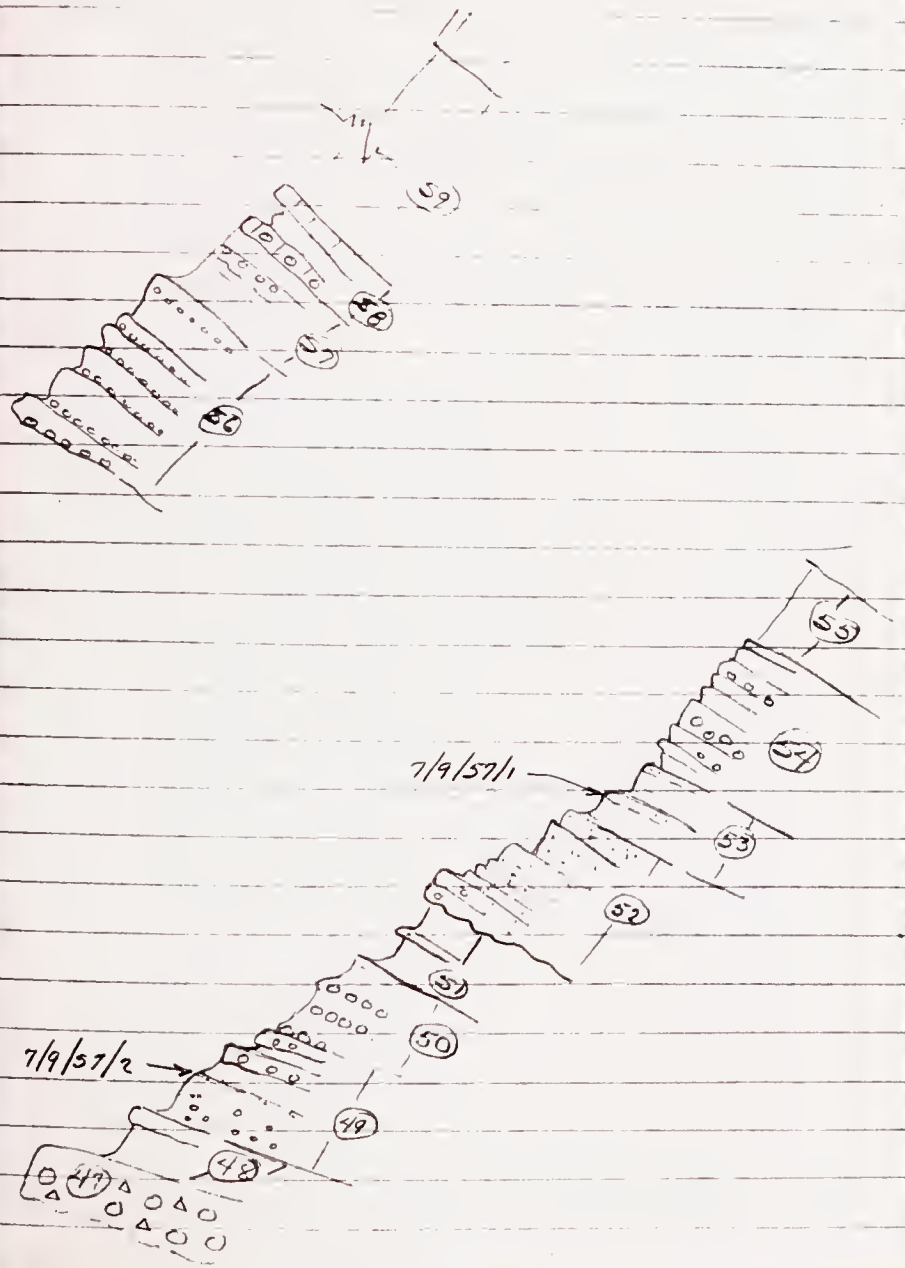
48.) Shale, very silty, grades into a 6" sandy siltstone. Light yellow-brown weathering
3'

49.) Congl., fine sandy matrix, poorly cemented, 1/2" diameter pebbles — a few 2 to 4" bands of greenish gray siltstones. 6'
Collection 7/9/57/2

50.) Congl., 3" to 4" cobbles at base of a subunit. The subunits grade to a ledge forming (indurated) fine sandstone. 3 or 4 such subunits observed. Top of each subunit is rather planar, Coarsest Congl. rest right on top of this planar surface.
14'

51.) Shale and siltstone, gray to yellow-brown,
5'

52.) Sandstone, yellow gray weathering, in 4" to 10" beds with 2" silt partings.
16'






53) like #50, 1/2" to 1" pebbles, 5'
This grades laterally into 6' of gray & yellow shale & siltstone
Collection 7/9/57/1

54.) Sandstone and congls. 3" to 3' lenticular beds. Congls. 2" diam max. Sand is mostly Calcarenite, 10'

55.) Covered 6' – mostly gray to greenish gray siltstone

56.) A multicyclic(?) unit like #50, 3" cobbles 1' to 1 1/2' per subunit. 9', calcarenite sandstone are very fine to fine size

57.) Sandstone – very silty, & very fine sand size greenish yellow brown weathering, 3' middle ledge 1/2" to 1" pebbles
4 1/2'

58.) Calcarenite & Calcareniti – 4" to 6" silt parting
2' gray to slightly yellow gray weathering.

59.) 57' covered

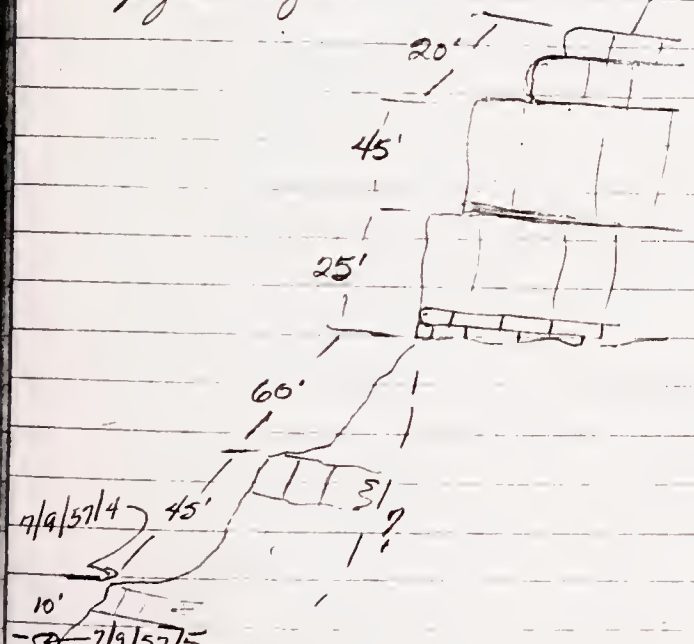
60.) Metamorphosed Ls, and some baked shale
5'

61.) Rhyolite dike

~~Top of Section~~ [illegible]

Collection 7/9/57/3 - from ant hill on smaller WC knoll, in about horizon of #25 or #26 of section VII.

Collection 7/9/57/~~8~~ - dark gray ls in slope of #2 (gray ls) of King Outlier ~~SE~~ flank 1/3 of way up from gate - I doubt if it is in place




yellow [illegible] dark gray ls cobbles, rarely [illegible]



# Section 26



Section 8a 2½ miles NE of Neal Ranch House (Jay Br)
Lower part of section badly covered.

1) Sandstone, fine size, yellow weathering - Tetracorals, brachiopods, sponges?, fusulinids? These are fairly prolific and most fossils are empty molds
1' to 2'

2) Covered 12'

3) Ls, gray, shell hash, bracks, crinoids, fusulinids
9', Collection 7/9/57/6,
4" to 1' bedding. At top of unit a bed like #1 as capping.

4.) Covered. 29'

5.) Ls, gray at bottom (2') 7/9/57/7 42' above are gray brown weathering dolostone no fossils identifiable. 2" to 4' beds

6.) Covered 14'

7.) Dolostone, yellow brown weathering. 1' to 3' beds
12'

Section 8a runs up a small slope. The various angles, bends and covered intervals between these outcrops are suggestive of some structural disturbance.

Section 8b begins on what I believe is bed 7 of 8a

8.) 69' covered.

9.) Sandstone, poorly indurated, v. fine sand size, some silt, well sorted however. $CaCO_3$ as common as sand grains - greenish gray and yellowish. 36' 1"-3" beds.

10.) Ls., nodular uneven bedding, 3" to 6" beds
Collection 7/9/57/10 3' above base
38' (See page 21) Collection 7/9/57/11
15' above base.

11.) Siltstone, pebbly, yellow weathering, some bands are more pebble than silt! 15' poorly cemented

12.) Siltstone with pebbles - siliceous cement 2'



# Section 26

13.) Shale and siltstone (10') green gray colors, 2 6" welded siltstones (siliceous) weathering

14.) Sandstone, very fine to fine grained, siliceous cement 2'

15.) Shale 9' green-gray "bumpy", mostly covered

16.) Siltstone w/ siliceous cement, 6" to 2' beds - 2" to 6" shale or silt partings. buff colored. 11'

17.) Shale (+ some siltstone), in beds 6" to 1', siliceous siltstones, in 1" layers 10'
Collection 7/9/57/12

18.) Covered 26'

19.) Siltstone, siliceous buff - [2']

20.) Ls, yellow weathering 3' - brown flakes where these oyers once found = very silty

21.) Covered 16'

22.) Sandstone, pinkish brown, weathering laminated Calcarenite
6"

23.) Covered 30'

24.) Silty, Brown-orange weathering, dolostone. 4' was fossiliferous

25.) Covered, [25'] above that Coarse Calcarenite
40' or more –



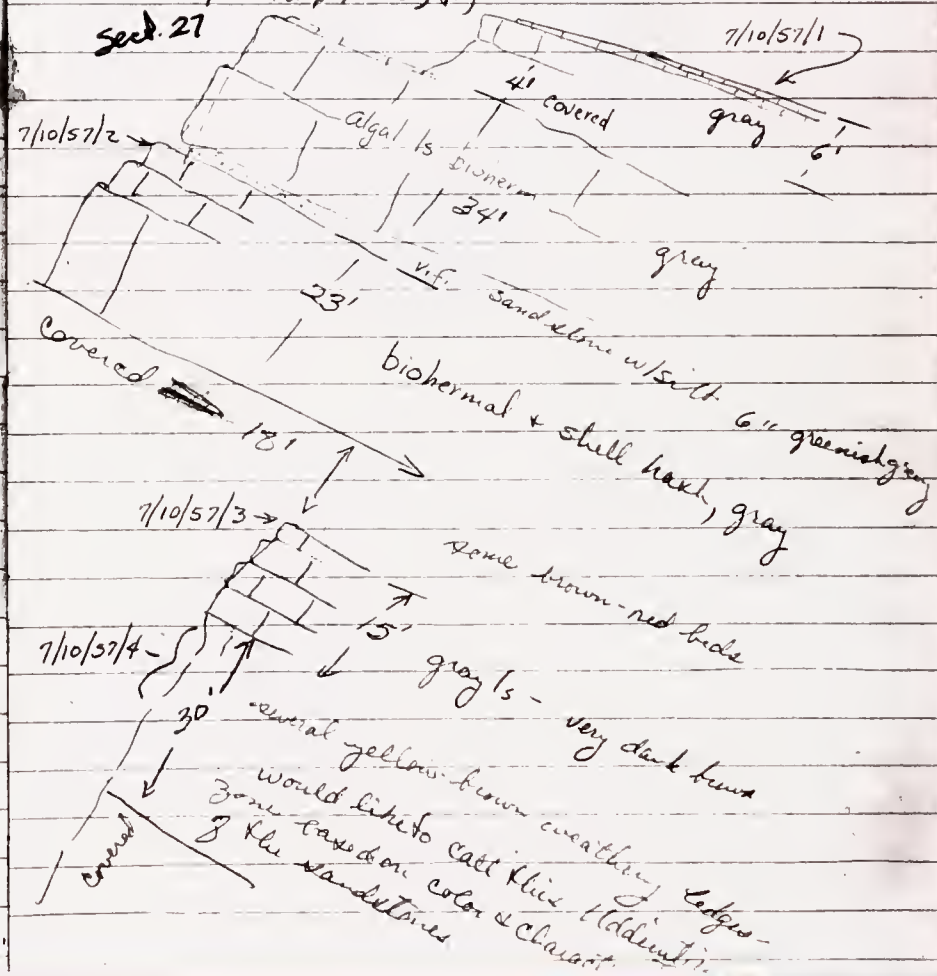
# Sect 27



7/10/57 C. Brooks Ranch SW exposures. also over the fence on to part of the Neal Ranch.

The ls cliffs on the NE. part of the Neal Ranch are lithologically continuous with the interval #3 through #7 of Section 8a. The #9 unit thickens & thins but seems to be fairly continuous throughout.

Section 9 (dip 7°–10°) (N)



(76) 29

Sect. 29 [see p. 150 of Nb 2]

Section 10 (dip 10°) (N)

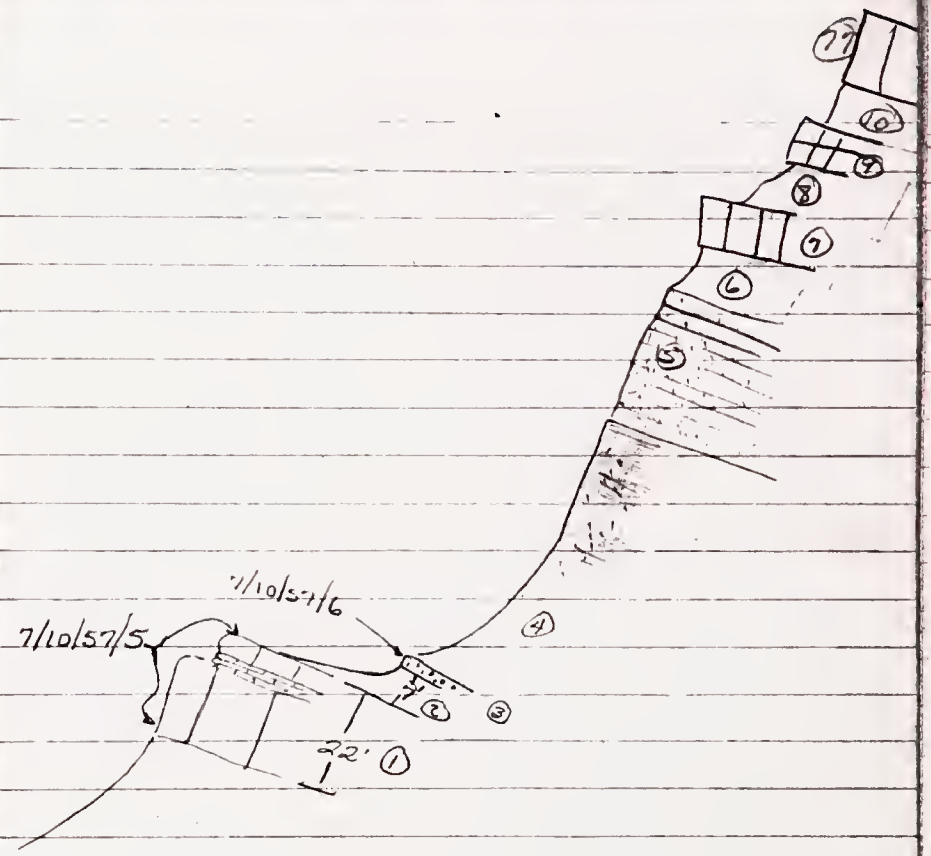
Covered below - float looks like bed #2 section I

1.) LS, organic fragmental, crinoids brachiopods weathers light gray with tinge of yellow
2 rubble zones near base -
a) 14' massive
b) 3' in 1' beds (gray
c) 5' gray & yellow massive
Top Goptank

2.) Covered 7' some gray shale, probably all red

3.) Sandstone, very calcareous (grains) $Fe_2O_3 + H_2O$ acting as cement? weathers deep yellow brown.
3' There are surfaces coated with crinoid frags.

4) Shale gray with few gray siltstones + v.f. sandstones grading upward into dominant silt + sand over the shale - unit is essentially gray weathering throughout, becoming slightly yellow near top. 139'




5.) Sandstone fine grain, yellow orange weathering 3" to 8" beds, even bedding, nearly uniform size + color throughout unit. total 53' Upper 3' are in 1' beds, paler colors than below.

6.) 15' covered

7.) Ls, gray, rather fine. shell hash. mostly brachiopod fragments recognizable
8'

8.) 14' Covered

9.) Ls, gray massive, shell hash, 2 beds 6' separated by 6" of ls rubble.
12½'

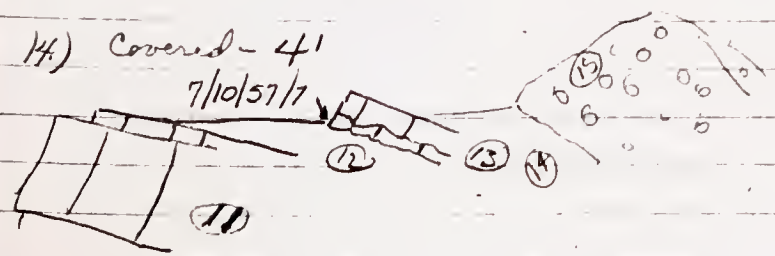
10.) Covered in part - most is a less resistant nodular limestone gray brown weathering brachiopod hash.
23'

11) Ls, gray massive bioherm 28' (lobed!)

12.) Covered 5'

13) Ls, gray, rubbly at base 2½' fine hash -

14) Covered - 4'






15.) Calcarenite, cobbles 4" to 6" diam, (largest); light-brownish gray weathering ls matrix. This looks like the "Hess Conglo" in the Wolfcamp Hills
15' plus (eroded upper beds)

Colored Picture #24 or 25 - of a "typical" (?) cyclic sequence of wolfcamp.

Collection 7/10/57/4

1) gray-yellow shale } 2' to 3½'
2) silty and fully fusulines }
3) ls rubble 1'
4.) Calcarenite 8" } orange-brown weathering
5.) " 2' }

This is probably not typical of the wolfcamp hills, but seems typical of earlier exposures on Brooks Ranch.

Near north tank (1 mile) W. of Brooks Ranch

Section 11 – began at top of Gaptank ls.
(dip 70°N)

1.) Ls, (Gaptank) dark gray weathering, 8' massive, upper part contains 1/4" to 1/2" gravels calcarenite only in upper part.

2.) Covered 11'

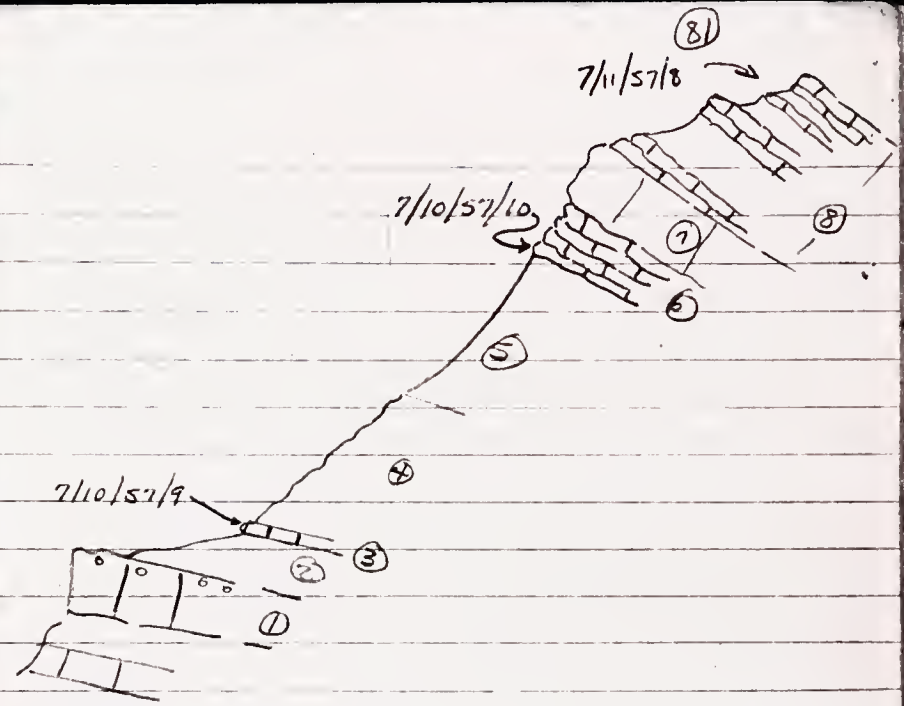
3.) Ls, dark gray, but not readily identifiable 1' Collection 7/10/57/9 fetid, black on fresh surface, weathers dark gray with spots of iron stain.

4.) Sandstone, very limy, light yellow to orange weathering, 6" to 1' beds, 34'

5.) Covered, probably gray shale 27'

6.) Calcarenite, gray weathering, fine sandy, and quite a bit of siliceous silt size. 1" to 6" beds, irregular bedding 15' 7/10/57/10

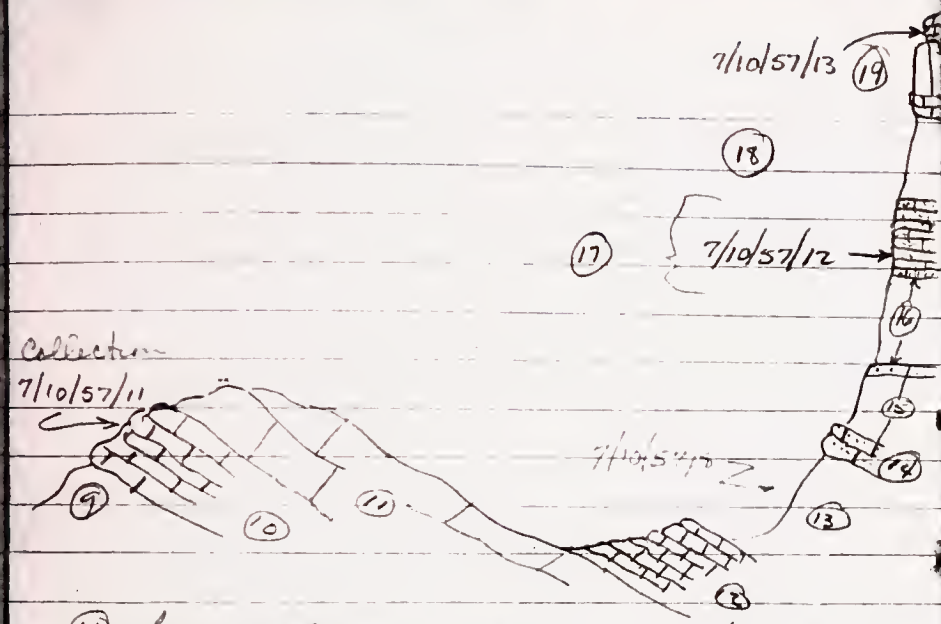
7.) Ls, blue gray weathering, massive ~~bioturbated~~, black specs but very fine grained. 4'




8.) Ls, light gray to light iron or tan weathering. beds 2" to 6", uneven or rumbly. fine grained for most part. (no large grains.) several intervals are covered, but seems to be less resistant ls rubble. 23'

9.) Covered 17'

10.) Ls, blue gray, sort of a rubble, but almost a calcarenite. darker "pebbles" are in a lighter matrix, but the difference seems to be one is recrystallized around the other, not good pebbles. 22' 1" to 8" beds 7/10/57/11




(11) Ls, light gray weathering, massive, fine grained, 11'

12.) Ls, shell hash, weathered mottled gray-brown, crinoids, bryozoans, a few breccia, 1/4" to 6" beds., a few inches of shale at the base of this unit. Top of unit has brown weathering color characteristic of the middle & upper Dolfeny cycles.
15'

13.) Shales in lower part (5' to 7'), becoming more silty and sandy, fossiliferous sandstone in upper 2' to 3', 1' shell hash
Collection 7/10/57/8 see note on picture p. 79
18'




Between unit 12 + 13 slicken side surfaces were seen cutting the down dip exposure of bed 12, no major displacement has taken place, but this seem rather to be the adjustment to a slight Pond Hill warping forming a gentle syncline near the tank.

14.) Calcarenite, yellow to orange brown weathering quite quartz rich and might be best considered as a quartz sandstone. 2 1/2'

15.) Cycle —
a.) 4' gray shale
b.) 1' like 14 below (at top)

16.) Gray shale 9'
17.) Sandstone yellow weathering, 1' beds or less; 16'; The fine sandstones have a great deal up to 40 or 50% fusulines, crinoids, gastropods, — 7/10/57/12

18.) Covered, probably continuation of (17)
[15'?]

19.) Ls, weathers gray to brownish gray, shell hash, breccia, some fusulines.
[12'?] 7/10/57/13

20.) like #19 7'

21.) Sandstone, v.f. high $CaCO_3$ 4' greenish-yellow

22.) like #19, 21'; changes to dolomite along outcrop (100')

Although no conglomerate beds were found, I believe beds 19-22 are in the same interval as the "Hess" Congl. of section 10.

The conglomerate beds in the lower Hess in Sec. 8 and in Section 11 leave me believe the congl. in the Wolfcamp Hills and in section 10 are local lenses and not a good mapping horizon. The light gray is at the approximate level of these conglomerates appears to be a fairly consistent outcropping horizon. Without the benefit of paleontologic evidence I would at this time suggest the beginning of a slight lull to verify sandstone above the highest "cyclic" Wolfcamp in the Wolfcamp hills seems to be a persistent unit also, although it is often obscured by talus.

(congl. or coarse sandstone)



The upper beds of the Wolfcamp are apparently missing in the western portion of the Brooks Ranch as a result of erosion. The 15 cliff forming Wolfcamp units is probably equivalent to the 42 gray 15 member cliffing in the Hills proper. Upper Wolfcamp cyclic deposits were observed down dip from the eastern most cliff on the Brooks Ranch (to be measured later) and also at section 11. The gaptank limestone becomes the ~~uppermost~~ cliff former in the low hills east of section 11 because of thinning of the 42 gray member and also because of some thickening of that (gaptank) unit to the east.

No

The upper Wolfcamp beds in Sect. 11 are in a structural low and show evidence of being deformed slightly prior to Hess's deposition.

28

Sect. 28

7/11/57/

Section 12; at head of draw N of section 10
covered below

1.) LS, gray, massive beds, 3 to 20' bedding
biohermal, rather [illegible] fragments - 51'

2.) Covered 7'

3.) LS, gray, uneven bedding near base,
more massive higher, gray weathering
Crinoid stems + [illegible] near base
3' 7/11/57/1

4.) 1' Covered

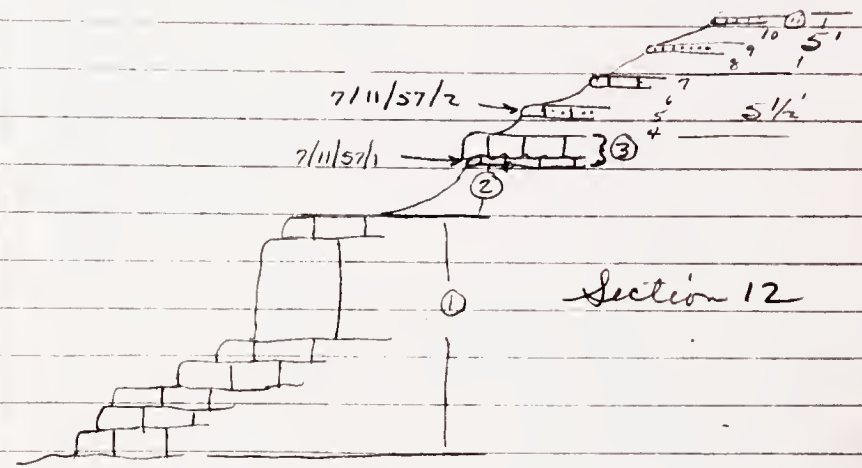
5.) Calcarenite, yellow brown weathering, brown
gray on fresh surface, some fusulinids
and brachiopod fragments - 1 1/2'
7/11/57/2

6.) Covered 2'

7.) Calcarenite, yellow brown weathering
some mottled gray, corals, crinoids, + brachiopod
fragments. [1']

8.) Covered, gray brown shale fragments 1 1/2'






9.) Sandstone fine grained, yellow to gray
brown weathering, 6" (calcareous quartz)

10.) Shale gray, mostly covered 2'

11.) Sandstone, fine grained, orange brown
weathering, calcareous quartz
8" to 1'

12) Mixed brown to gray with 1" to 3" blue quartzite & sandstone (fine) poorly indurated. 22'

13) Covered 23'

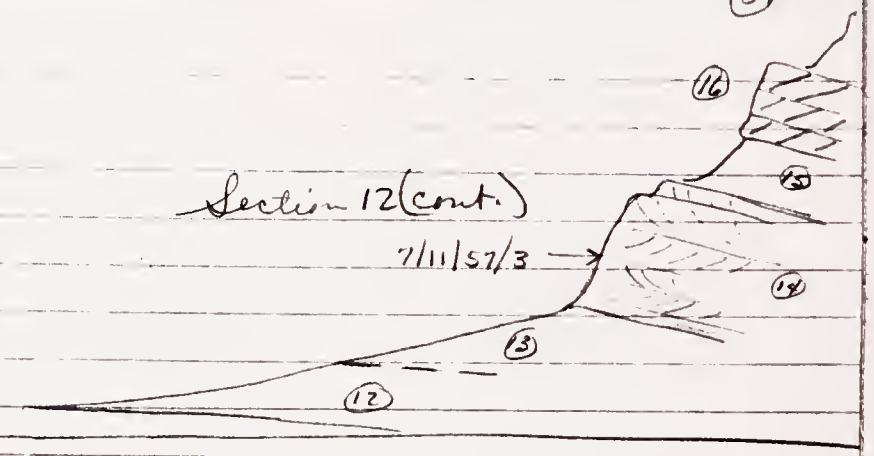
14) Sandstone. brown to yellow weathering in 3" to 6" beds, gray on fresh surface. Calcite cement & some calcite grains <30 to 40%. Crossbedding 1/2" to 1" grain size sand well sorted, I believe this to be earlier [illegible] or back beach, maybe a little [illegible]. 27' 7/11/57/3

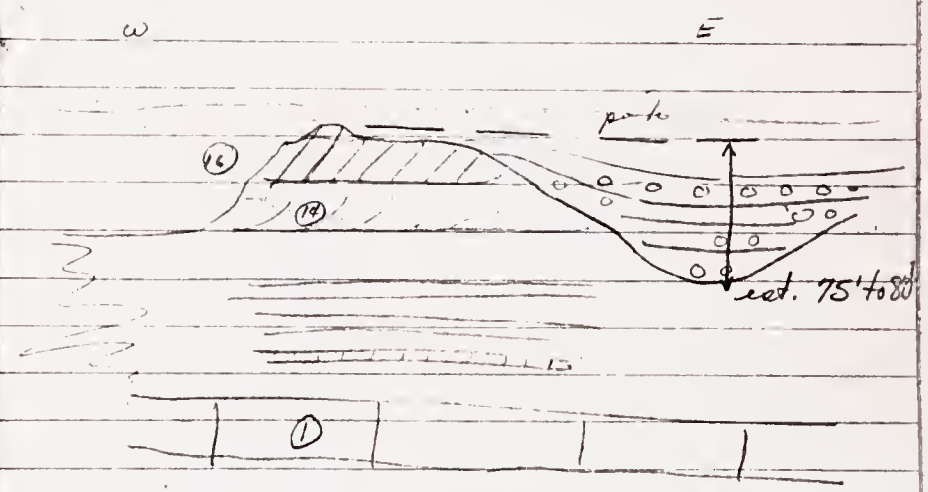
15) Covered 18', looks rubble?

16) Sandstone, 45'+ brown weathering.

Above are undoubted Hess beds of general position & lithology as 19 through 21 of section 8L.






Really need to work this out on photos!

# Sect 31

Section 13a – 1/4 E of Section 11 up front of Lenor ridge – To top of hill 4752 Sect. 27 of King

11.) Ls, dark gray, (capstone) looks like beds of rubble – 3 to 4" diam blocks 5½' massive 7/11/57/4

12.) Ls, rubble, dark gray, in 3" beds very uneven, 1½'

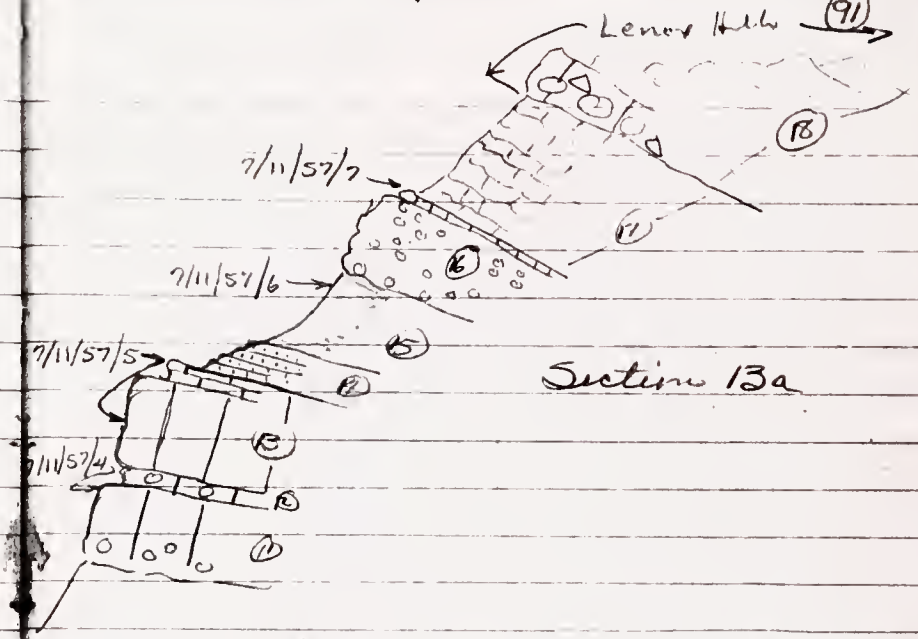
13.) Ls, like 7, upper 3' in 8" to 1' beds, lower 9' massive, weathers to irregularly pocked, but rather smooth massive. 7/11/57/5

14.) Sandstone, fine grained, weathers orange to yellow brown, some green colour patches. 3' to 6 beds; 3½'

15.) Covered, but seems to be a dark red brown shale zone. This is same color as exist top of ridge in p. 3/4 mile W. 7/11/57/6 7'

16) Calcarenite – all sizes, up to about 2" diam. Small pieces of Jasper chert and other cherts subangular to subrounded. Upper 1' organic frag 7'






Section 13a

17.) Mostly Covered, Ls, rubble, purples, gray, yellow-browns – 5" to 8" beds 28' 7/11/57/7

18) Calcarenite, cobbles 6" to 10" diam; mostly Ls cobbles, but a few large chert cobbles + quartzite also. Ls in 3' to 6' beds. cementing Ls weathers yellowish 45' to top of ridge

Collection 7/11/57/2 from the zone of #8 + #9 units in section 11. The ls have changed to Calcarenites and much thinner. They seem to thin rather than being entirely truncated at Section 12. This collection is from a saddle on the N.W. side of the Ridge. Section 13 is over.

Collection 7/11/57/1 from Gaptank ls, dark gray (uppermost Gaptank ls) 2 bags, one for strat entitled, one for dark ls. The stream gully on Brooks Ranch 1 mile west of Ranch House

Remark - It certainly won't like P. King mapping.



Sect. 31



7/12/57

Section 13b - Below unit 1 of section 13, there is an exposure of gray-brown shale and orange sandstones. Whether this is a zone in the Gaptank or the illusive Uddenites zone is the major concern. The fossil evidence to date would suggest to me it is a zone in the Gaptank - (from a vertical distance, dip 10° to the N.)

1.) Ls, dark gray, organic fragmental, mostly brachiopods and crinoids -
25'

2.) Covered 20'

3.) Ls, yellow weathering, dark gray fresh surface, organic fragmental - see Collection 7/12/57/2
1'

4.) Covered 12'

5.) Ls, black to dark gray, organic hash
1½'

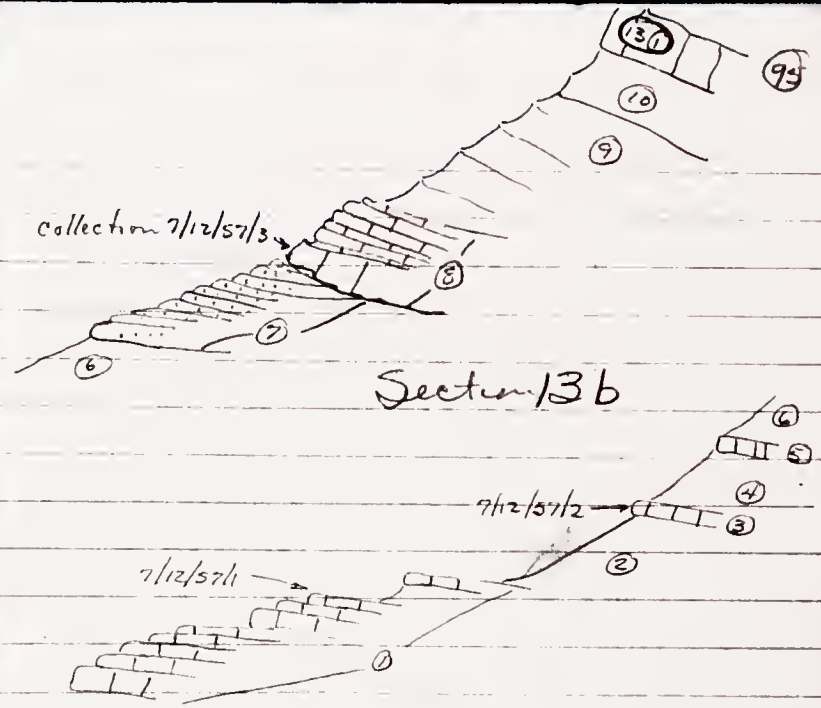
6.) Covered - 28' probably mostly of #5 lith.

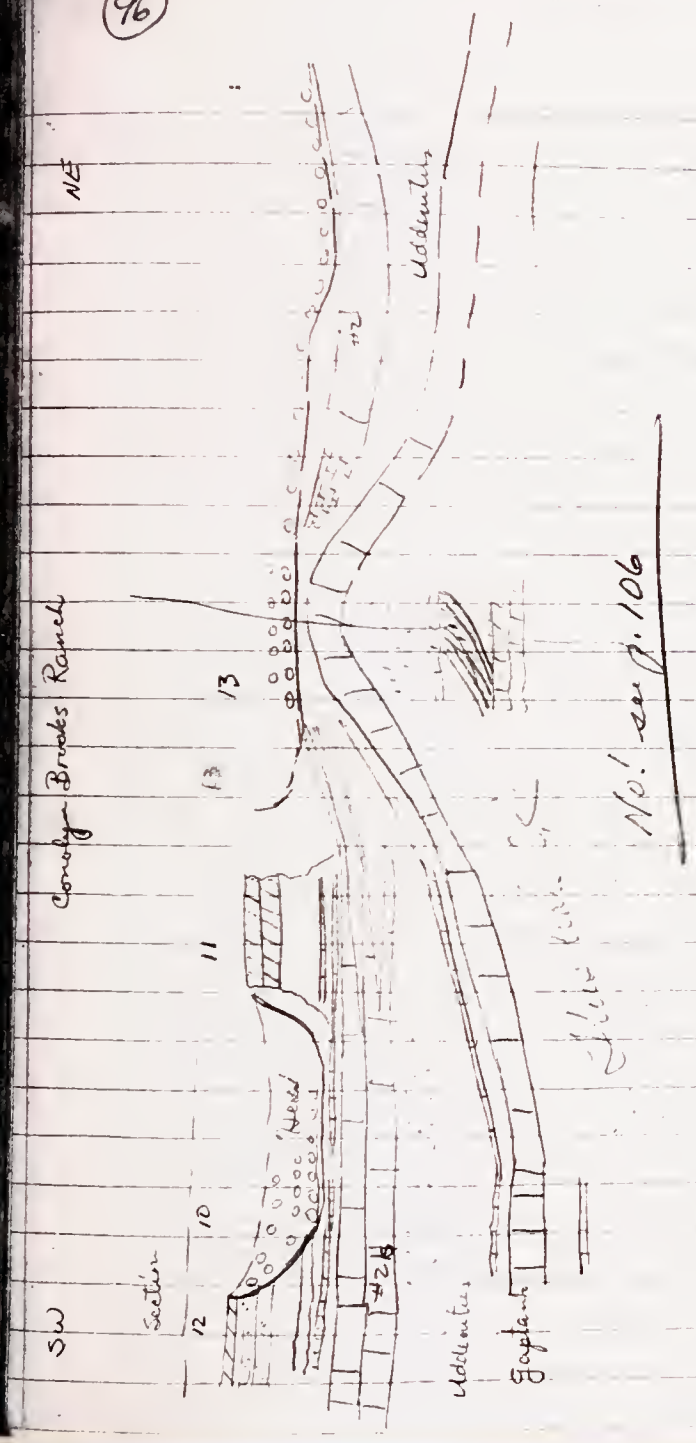
7.) ~~Calcarenite~~ Sandstone, light orange-brown weathering, much ~~[illegible]~~ quartz; cross bedding, sizes not well sorted, probably fluviatile deposition. This unit appears to be truncated to the west by unit #8. 21'; in 6" to 3' beds

8.) Ls, dark gray, organic fragmental very uneven lower bedding plane, 3' to 5' of rubble cut into truncated edges of #7 11'

9.) Alternations of Calcarenites and brown gray shale, Calcarenites become very fine pebble conglo higher in unit; 55' to 60' interval is badly covered.

10.) Covered, 40' to base of section 13a unit #1.








# Sect. 34 (part)



[see p. 163 of Nb 2]

Section 14 3/8 mile west of C. Brooks Ranch House

Covered below

1.) Sandstone, light orange brown weathering, $CaCO_3$ cement in part, a few grainy calcite. ~ 6" to 2' to 3' beds — 38'
(see unit 7 sect. 13b)

2.) Shale, gray to brown with 2 beds (1') like ~/ 17'

3.) Ls, silty & sandy, but abundant fusulines weathers light lemon yellow. Brach shells also abundant. Sec 3" to 6" bed, uneven bedding surfaces. 29' (7/11/57/4 NO!)
7/28/58/1 checksample 7/12/57/4

4.) Covered, 55': If other side of gully is compared, this interval is a massive calcarenite, gray weathering with indistinct 6" to 6' beds. It caps that ridge but not the one the section climbs. [Fault?]

5.) Ls, gray mottled colors, darker "pebbles?" in a lighter matrix; 1½' to 3" beds irregular bedding planes 18'

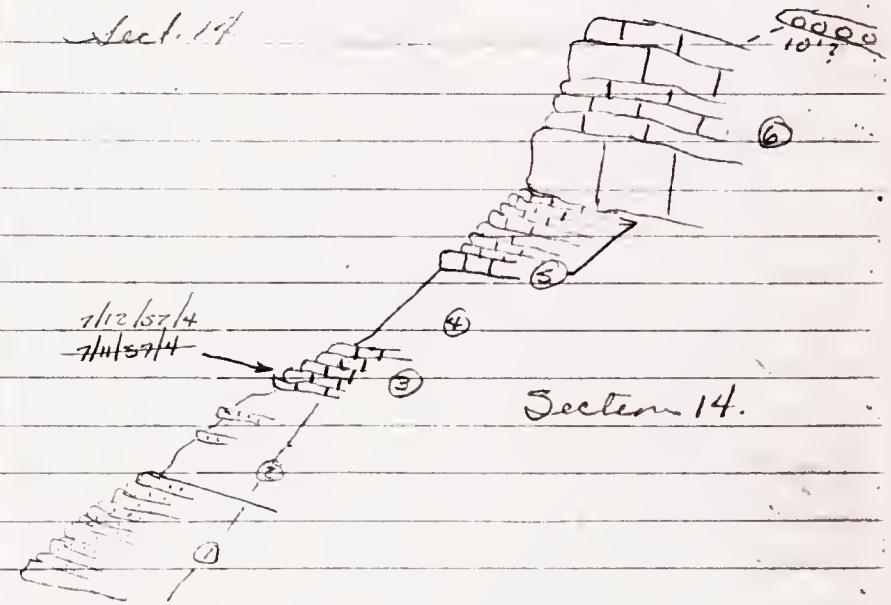
6) Ls, gray massive, 44' crinoid fragments, brachiopod shells

7) "Hess Congl." about 10' above this last unit 6. This is on a dip slope so it is difficult to set the interval between the top of #6 + the "Hess" congl, but it is within the 10'

Along the front of the central segment of the Brooks Ranch wolfcamp ridge most of the drains are the result of erosion on the zone of weakness caused by faulting. These faults have throws of 10' to 50'. The Ls. ledges back of the ridge have several zones of slide rocks which I interpret as movement on bedding planes as the [illegible] complex was tilted during later ~~[illegible]~~ Marathon lavin movement. Probably post K although I have no direct evidence for the time of movement. The faults perpendicular to strike cute the Hess + Leonard so that it aids in drain-forming there also. The [illegible] of K caps are apparently fractured as a differential movement on



Sect. 14




Section 14.

These faults and can be explained in this manner.

The evidence in section 13 suggests that the Gaptank and the wolfcamp limestones either converge and form a combined mass of Ls, or that the wolfcamp is lacking. The study of sect. 14 indicates this is more to this that at first meets the eye. I believe, based only on lithology that unit 3 of section 14 is the same unit as #1 of section 13a. The #1 + #2 beds of section 14 are probably the same beds #2 + 13b. The #8 beds of 13b may

however, be equal to the #3 beds of section 14.

The fusulines may tell us the answer, but if the massive of Section 13b is the Uddenites zone what happens to the gaptank 15 feet above section 11 and section 13? is what I've been calling gaptank in the western part of the Brooks Ranch really Tugs "Z" member in the W.C.H.S.? You know, Charlie this could be confusing!

Another question is what is the red horizon or interval which sometimes places seems to separate the massive Wolfcamp limestone (tuny #2?) and the "Hess" conglomerate (which is often not a calcarenite at its base). I suspect the upper dolostone in section 11 is equivalent to the Conglo.

7/13/57 – went to El Paso to meet John Pope (Harvard '51) (Mich. 56 MS) (Cincinnati Ty) and his wife.

Charles Marden & Pete Rowe left on the 12th for Austin, they were instructors at U.T. field camp, Leary's Ranch.





7/16/57 (34)

Section 15a – 3/8 mile NE of road into central valley on Brooks Ranch. (10° dip, N60W)

gaptank?

1.) LS, dark brown-gray, very fine Xtalline, fusulines, semibeds gray to gray tan, This exposure is one of several small isolated rubble heaps out from foot of cliff. This pile of LS is not bedded, but appears to be more or less in place. If the fusulines are gaptank in age then I believe it is safe to consider this outcrop in place. More than 5'

Collection 7/16/57/1 [Leonard Sch. conodontologist 1-64 C.R.]

2.) Covered 83'

3.) Shale, light gray (in part covered), 70 to 8–2" to 3" sand and silty sand (Quart.) bands scattered in upper half of unit; 28' 7/16/57/2

4.) Sandstone, Orange brown weathering, med quartz sand, with rare fragments of pebble (1/4 to 1/2 dia.) Brachiopods, crinoid stems, ~~rare~~ gonatites wood fragments. 2'

5.) Shale, gray to bluish gray, greenish gray, 4 or 5 - 1" v.f. sandstone bands, 10'

6.) Sandstone. Diagenesis weathering, fine grain, sand size with "Calcareous cement." A few wood fragments. The lower 1' of this unit is light green gray weathering, sand sizes the same, difference seems to be the amount of iron oxide with the $CaCO_3$ cement.
8'

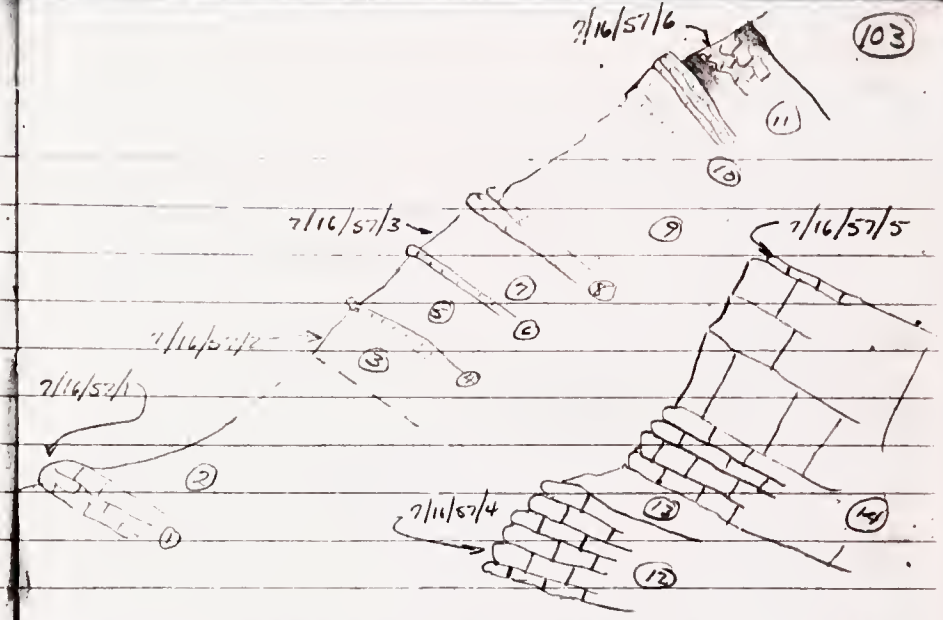
7.) Shale, greenish gray, a few ½" v.f. sand or siltstone horizons. (7/16/57/3) 27'

8) Sandstone, orange brown weathering, v.f. sand size, much silt → 30%; brachiopods, wood, crinoid stems; 2 to 3" beds 3'

9) like 7 in lower part, gradually, upwards, the lithology of unit 8 becomes dominant, beds 3" to 4" in the sandstone: 46'

10.) Sandstone, light brown weathering, (3' of gradational beds at base to this unit into the blue gray shale at top) #11. 6" to 2' bedding: 19'






11) Covered 23', probably blue gray shale with possibly one limestone bed 8'+, uneven nodular bedding surfaces, fossils, bryozoan, crinoid, brach collection 7/16/57/6

12) LS, gray weathering, massive beds, black weather rounded, (not angular) This unit has wavy bedding surfaces and seems to represent a fore reef accumulation of dumped debris
6" to 8' beds, 7/16/57/4
32'

13) Covered 8' probably same as 17

14) LS, light brown weathering, Cliff former, 2' to 15' beds, massive weathering as a unit along most of this ridge.
≈ 3' to top of ridge.

Section 15b — down dip slope and across draw and up to a point which is lithologically similar & in the correct altitude to be bed #14 of section 15a.

15) Covered 7' gray-green shale for most part

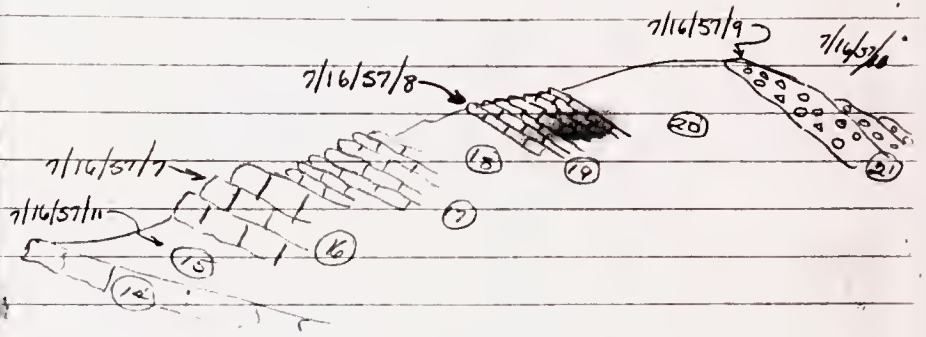
16) Ls, gray (light green tint) nodular, wavy bedding 7' 7/16/57/7
The upper 6" to 8" of this unit is now caliche. The caliche becomes less dominant after that. This seems to have been a horizon of higher moisture that either that above or below.

17) ~~[illegible]~~ 7/11 Calcareous, all of about same size, probably biochemical debris deposit - 16' - no fossils apparent. 3-5' beds - gray weathering, like 12

18) Covered. 10'

19) Calcareous + organic fragmental 8" to 3" beds Crinoid stems + fusulines. 7/16/57/8
12' weathers pink brown to reddish brown very uneven bedding,






20.) Covered, 16'

21.) "Congloo, Hess.", 7/16/57/9 - a collection of cobbles from covered exposed bed. Many shades of Ls, dark gray or nearly black to light gray, white + black cherts, 7/16/57/10 - fusulines in with the fines of the congloo.
about 110' thick

[see p. 137 of Nb. 2]

7/17/57 – Allison Ranch Gaptank area –
The manner in which the gaptank is lenses is striking. They seem to originate in the "Uddenite" zone and thicken rapidly to the east and then thin to disappearence. I wonder whether this Uddenite zone is even approximately equivalent to that of the "type" area (WCHS)

Section 16, North of Highway along Allison-Moon Fence Line North –

Covered below –

3.) Sandstone, 70% or more Quartz, $CaCO_3$ cement. Brown Orange weathering, med (1/8 to 1/4") lamellae, even-not irregular; in beds 3" to 1', some beds are compos. of many small shell fragments –

1.) Ls. brown yellow weathering, organic fragmental – Bracks, bryozoans, ammonds, pelecypods, fusulinids
Coll. 7/17/57/1 5 1/2'

2.) Covered – 21'

*3) cont I interpret this to be a littoral deposit, has whole shells & fine tate bracks – 7/17/57/2
[12']



Today picture on page 96 looks like this of we can accept Kings age on the *1 bed in my section 10, page 76.

4.) Covered, , 2 or 3 = 6" bands of brown-orange weathering sandstones. Collection 7/17/57/3 from ant hills 34'

5.) Ls, dark gray weathering, organic fragmental crinoids & bracks mainly. 7/17/57/4 at 38' 3" to 2' beds 61' (Transfer end 2)

6.) Covered, 66'

7.) Ls, dark gray, with large amounts of orange-brown gritty sandstone interbedded irregular Ls marks. 8' 7/17/57/5

8) Covered, 13'

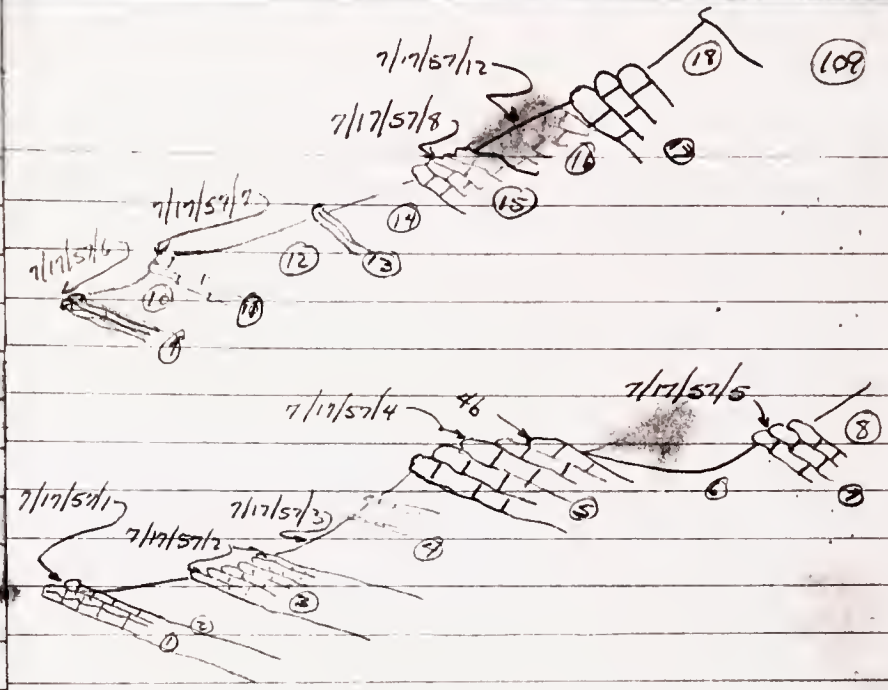
9.) Calcarenite and Ss, dark weathering, dark gray, on fresh surface. 3½' 2" to 6" beds 7/17/57/6

10.) Covered, 10'

11.) Ls, weathers orange-brown, fresh, brown-dark gray. Shell hash, foraminifera, crinoids & bracks. 6" to 1' beds [4'] 7/17/57/7

12.) Covered, 13'






13.) Sandstone - orange-brown weathering, fine sandy, laminated - see colour picture 6" - 8"

14.) Covered, 22'

15.) Ls, med. gray weathering, fine grain Calcarenite, many silicified brachiopods, collection 7/17/57/8 about 4' above base - crinoids common 6'

16.) Covered, but probably like #15 - 38' to the east becomes a gray green shale but looks to be more than the measured 38' 7/17/57/12

17.) Ls, gray-brown weathering, ~~pale~~ frag. of shells, mostly Talgah? tracks. 1" to 2' ieso over all weathering creamy — 7'

18.) Covered 21'

19.) Ls, (calcarenite) with some quartz 10-25%, chert & quartzite pebbles 1% or less; weathers some brown shades, whitish specks — wavy uneven bedding, 1" to 2' thick;
50' the upper 40' become very quartzitic — about 85-90% $SiO_2$ excluding cement. Become strongly cemented upwards

20.) Covered, 15', probably like unit 19 ~~[illegible]~~ see note page 112. 8/22/58/7 and 7/17/57/9

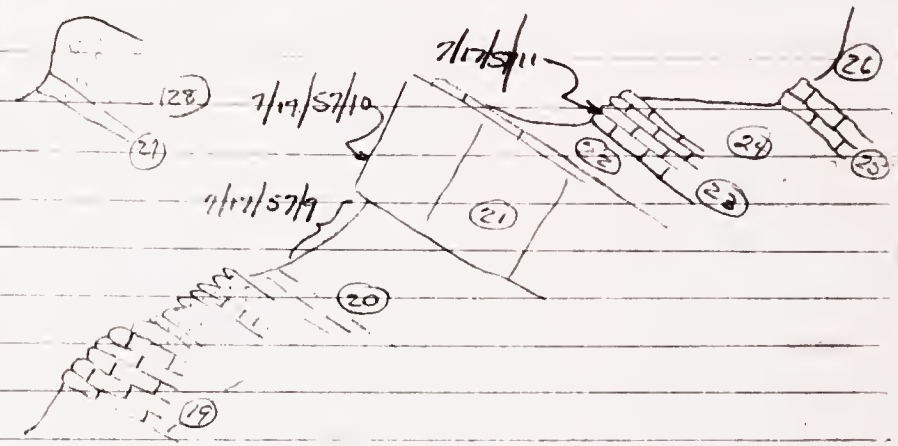
21.) Ls, Pisolitic, [illegible] gray weathering; nodular bedding in 6-10' intervals, but not usual "true" bedding 31'
biochemical [illegible], very light gray on fresh surface. very fine grained, pisolitic, mostly recrystallized?

22.) Covered. 9'

Ch. 8/22/58/6

23.) Ls, brown gray weathering, dark gray on fresh surface.






uneven bedding 2' to 6' wide, crinoidal material common. 12'

24.) Covered, 20'

25.) Ls, weathers orange brown, has brown (Iron stain) chert nodules — 9'

26.) Covered, 36

27.) Sandstone, quartz grains, med.; calcareous cemented brown & green grains, chert & quartzite pebbles (1/4" dia to 1/2"). Some massive, some in 1/4" laminae. 31

28.) Congl.; has same sandstone as 27, but flat pebbles become 11" to 8" diam and are to about 75 to 80% of lithology.

There is almost no ls in this cngl, but it still seems to be the "Hess" conglom. On other side ls [illegible] & cobbles as high as 70%.

#20 In the [illegible] Interval 20 is exposed. Calcareous shale & siltstone, rich fossiliferous in steep creek. Collected 7/17/57/9. White to light cream weathering. Becomes more calcareous and grades 2-3' into wavy bedded lime to biohermal seq. 35'-40' ~~[illegible]~~

The "[illegible]" of Kings Gaptank appears to have been in the "Addendum" gone past to the west of Gaptank. I find no fossil evidence which would assign a Wolfcamp age to Kings ~~[illegible]~~ in this area. It is not until we get above that unit that we find a distinct break in lithology.



7/18/57 —

East of Texas Highway 51, beds of what I believe are Wolfcampian age (not exact lithology) are folded and faulted quite badly. The axis of a syncline strikes N 75° W from peaky K on NW side of Beat 4 to a valley in K on SE side of road.

**Slides read 7-18-57-11**

7/18/57/1 is from a sandstone in the creek in this syncline.

This syncline is probably due resulting from faulting NE of locality 7/18/57/1

50 yds NE of locality 7/18/57/1, bed is on end, probably due to fault, not overturned. These structures predate K although the K is [illegible] faulted (1' throw) in this zone of weakness.

This little area is very complex - 2 sets of faults; one N 75° W & one 2nd one N 3 to 5° E.

(114) 41

Gaptank locality

Section 17 – The [illegible] W. Wash, Canyon, concealed [illegible] W.C. There are

1.) [illegible] 5' orange brown [illegible] 8/24/58/1

2.) Covered [illegible] distance prob. [illegible] ±20'

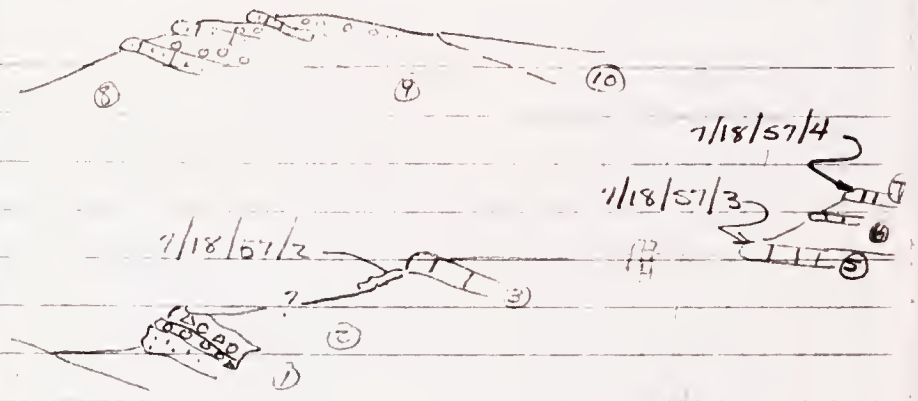
3.) Calcareous [illegible] weathering, dark gray [illegible] ss matrix [illegible] 7/18/57/2 Coarse [illegible] slopes) 4" to 2' beds, shale partings; 9'.

4.) Covered 33', paved over upturned edge [illegible] about 10' thick, Sweet [illegible] at 63' the [illegible] strikes [illegible] apparent cut by a fault [illegible] E side

[fault adds about 30' to the interval, better expand No. of old road]

5.) Ca[illegible] orange-tan weathering, [illegible] 1½'

6.) Nearly [illegible] and like 5 [illegible] 5'




(115)

7.) like unit 5, in 3" to 8' beds, 4'
The base of the unit has been faulted up

8.) To the [illegible] found the same [illegible] covered for 13', Then

9.) Calcareous, orange weathering with an increasing % of gravel, sand upward; interbedded conglo; quartzite & chert [illegible] but with some ss. [illegible] 24' – upper part dominantly conglo – lower part ss.

10. Covered probably the same as 9

Collection 7/18/57/5 – P. King Characteristics at base Gaptank along old road. (N dip of Anticline – [illegible] type area.

The [illegible] recognize the complicated structure of the [illegible] & believe there [illegible] is a block [illegible] the same red, faulted into 2 portions. The [illegible] units do this, and the [illegible] faults tend to make the units [illegible] thicker than they are normally.

The [illegible] the contact of the "upper" Wolfcamp contains Tonto (or Hayden) [illegible] simple, the Dimple in very dark [illegible], the Tonto Hayden are quartzites. The movements in the western [illegible] to [illegible] Section 5, section 17, but faulting may make the picture more complicated.

[illegible] look like the overburden to the [illegible] to place these [illegible] Section 17. [illegible] suggest [illegible] called these, but the Cathedral [illegible] to the upper Wolfcamp. [illegible] suggest an [illegible] to the [illegible] are [illegible] that the [illegible]



[illegible] about 12 miles? away to Thousand [illegible] Typical Cingle of the Bird Reef [illegible] get into the [illegible] from the [illegible] side here. Problems!

It will pay to investigate the outcrops in the Canyon south of the Allison Ranch. The "Wolfcamp" may be exposed there, but I really wonder!

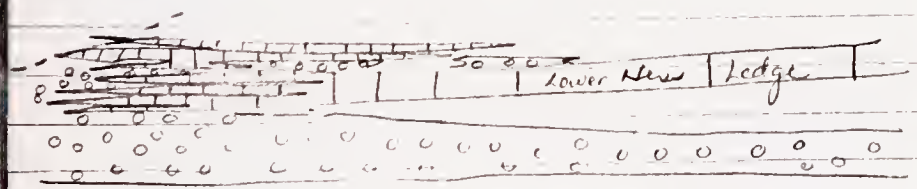
7/19/57

Mr. Moore wasn't home (Ranch), lives in Midland.

Decie Ranch.

The congl. lithology C.C.D. pointed out as Wolfcamp pinches the same interval out to the S.W. The lithology in magnus Jarvey mentioned near the road, I believe are SW extentions of the lower Hess Ledge. The lower Hess ledge 1/2 mile NE of the first stops contain "wolfcamp" lith conglomerates high into the section. The lower Hess ledge is [illegible] 1' to 3' Ls at the SW locality but the lower beds become massive to the NE and the upper Ls of this interval grade thru and [illegible] 1½ miles to the NE. The conglomerates below look like those

SE NW




within the Hess (lower) ledge. At the SW locality I believe Jarvey has misstaken the upper Hess ledge for the lower Hess ledge.



Collection ~~4/19/57/1~~ – a Ls cobble in the Wolfcamp Congl. From a pit place, but apparently from lower 1/2 of exposed Congl section about halfway between Wind Mill and Stop 1

(120) **6**

7/20/57 Lucero [illegible] SW ridge Sonny hills

Section 18 –

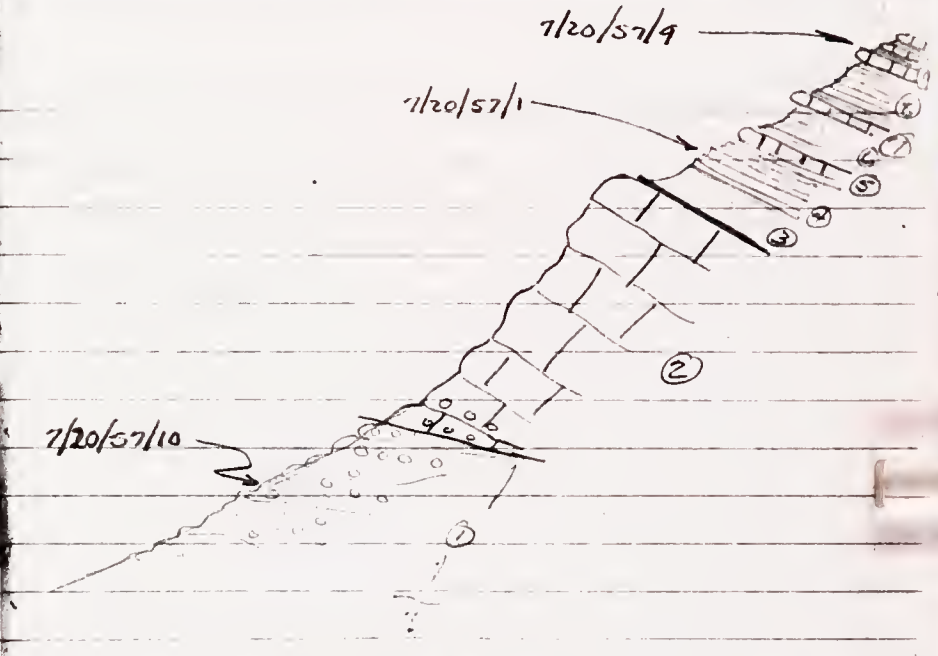
1.) Congl., basaltic clast. [illegible] a [illegible] type cement, gray sandstone, a [illegible] cement. $CaCO_3$ cement. Not known [illegible] the ~~cap~~ here [illegible] clast [illegible] the congl. [illegible] This mountain [illegible] covered, but the conglomerates are scattered on the only outcropping rocks.

55' Cobble of Congl – Collective – 7/20/57/10

2.) Ls, gray [illegible], some [illegible] cements [illegible], dip about 10° WNW. Zones with very thin ls cement are quite conglomeratic. The chief distinction between this & #2 is ls sands matrix & [illegible] matrix. The conglomerates [illegible] are about 2', but v.f. pebbles are present in the ls higher in this unit. Top of unit is very siliceous, well sorted, forms a 1" plate. Bedding between 1' to 4'; 52'. This unit [illegible] equal to lower three units.

3.) Covered 1';

(121)




4.) Siltstone v.f. sandstone, siliceous cement, [illegible] often irregular texture; Silicon cement is 2nd day use. 7/20/57/1

11'

5.) Ls, clastic, with chert pebbles 1', thins to NE thickens to SW

6.) like #4 5'

7.) like #5, 1½', thickens to SW

8.) like #4 6'

9.) Ls, clastic, 3 beds 4" to 8" thick, each with well sorted flat tops, separated by siltstones; 3' 7/20/57/9

10.) Covered 3'

11.) Ls, conglo, chert gravel, large pebbles; ls clastic sandy matrix. 1' to 2' beds; Top is same as flat surface, well sorted, and silicified ½" to 1". 9'

12.) Covered – 1', probably clastic ls, + conglo.

13.) Ls, organic frags, bryozoans, crinoid (stem) brachiopods; 7/20/57/2 ; 1½'

14.) Covered – 8'

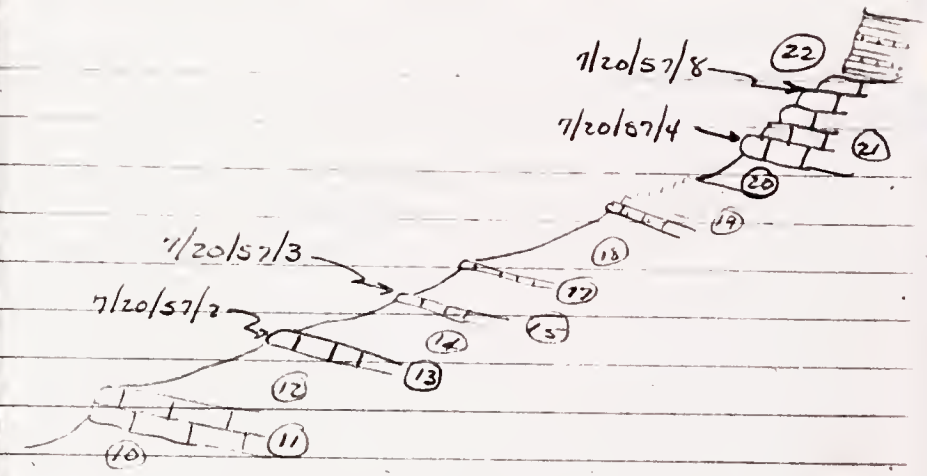
15.) Ls, organic frag. 7/20/57/3, rubbly at base becoming ~~silty~~ well sorted in upper 6", top 1" is silicified and laminated, top is flat. 2½'

16.) Covered 5'

17.) Ls, organic frag + clastic, some small chert granules – a fusuline or so, echinoid spine [2']

18.) 17' Covered






19.) Ls, fragmental (organic) and quartz f sand matrix, crinoid frags. + black shale, become more sandy upwards. 9'

20.) Covered – 6'

21.) Ls, clastic, gray weathering like the other lower clastic ls, has flat top w/ 1" silicified zone 8" to 1' 7/20/57/4 5 repeats of this cycle (at least) on 8" to 3' beds; 18' some chert chips 7/20/57/8 near top

22.) Sandstone, v.f. size, weathers light brown thin but uneven laminae. w/ 2, 3" lb. of the "21 type. 9'

23) Ls, clastic + organic frag. gray weathering with a tinge of brown. 2 cyclic beds one (a) 3'; (b) about 4'

Collection 7/20/51/5

Flat tops are reticulated + weather a brown iron oxide color. 7'

24) Covered, 14'

25.) Ls, calcareous, both clastic + organic frags. weather gray brown. 1' to 2' beds

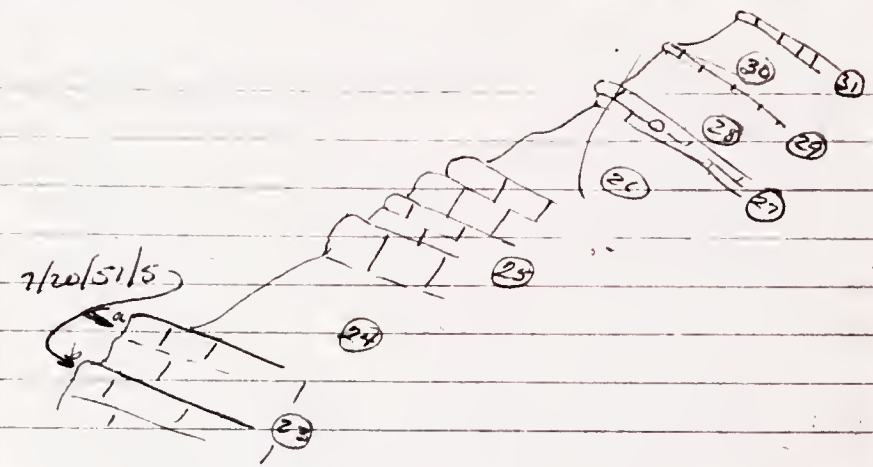
12'

limation + small echinoid spine N 10°E

26) Covered, 31', probably lt brown v.f. sandstone or siltstone.

27) Mark? This unit is well had detailed study. Massive Rx, no bed except near top in a irregular surface. 2 kinds of silty ls; one light brown, one light gray – they occur interlocked with each other – also coarse sandy chert + ls fragments are twisted and warped throughout the bed. Several kinds of brach shells, bryozoans, + fusulines – [illegible] a bed of slumped material






on an uneroded Permian mean-shore deposit, a 3" diam pebble is staring at me.

1½'

28.) 7', lt. brown weathering, v.f. sandstone.

29) Ls, gray (dark) clastic, some ¼" diam chert + quartzite, ⅛" red brown siliceous upper surface. 6" –

30) like 28., 8'

31.) Ls, lt. brown to gray brown weathering; very silty and v.f. sandy – an irregular 3" band of very fine pebbles. ½' –

32) Covered, 13', probably like #28

33.) Siltstone, very limy, lt. brown to brown gray weathering. 6"

34.) Sandstone & siltstones, sandstones v.f. grained grades into a 1' to 1½' limy rich reversal beds. [8']

35.) Sandstone, v.f. grained, lt. brown weathering up to 1" bedding 23'

36.) Covered, 5'

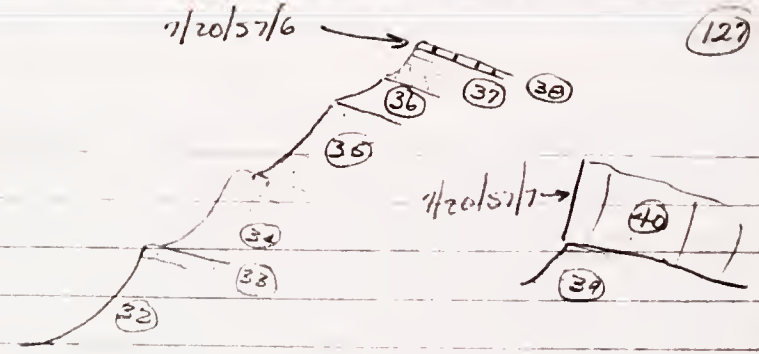
37.) same as " 5 – 8'

38.) LS, gray weathering 8", have little cephalopod [illegible] 7/20/57/6

39.) Sandstone, v.f. grained, lt. brown weathering 8'

40.) LS. Massive, gray weathering, fossiliferous, Upper Hess ledge






Collection 7/20/57/7 – a pecty float, found at about bed 34 – these graptolites are in richer from about #38 on, most likely from #40

Upper Hess ledge of this section the sequence or lithology is rather cyclic from the Hess ledge up to the upper part shows cyclic deposition, but with the change in either source of sediment or of depositional environment. I frankly don't know exactly where to draw formational boundaries. The top of bed #1 with the top of the Wolfcamp Conglo, the bed #2 limestone below is equal to the lower Hess ledge.

King calls the lower Hess ledge Hess, and the upper ledge, the 1st Leonard lime. Section 18 thus includes Wolfcamp (part), Hess, and lower Leonard rocks.

7

7/21/57 Section 19 — up to eastern most cliff forming Wolfcamp Congl. — topped by Bexar Co. Ledge
Deere Ranch
The lower part of this section is covered and is just bed up

no dip

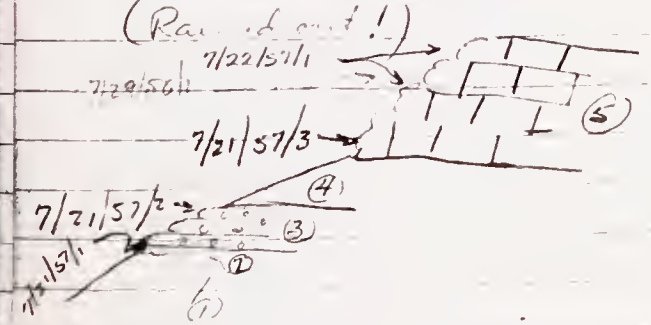
0.) Covered below

1.) Sandstone, green-gray weathering, much green alteration, 6', Collection 7/21/57/1

2.) Congl., brown weathering, mostly 1/4" to 1/2" chert pebbles, brown sand, some, buffs, crinoid stem fragments, 5', 7/21/57/2, 2" to 6" beds

3.) Covered, 10'

4.) Ls, red-gray weathering, [illegible], no dipnoid bedding, [illegible] Leaves, cephalopods, crinoid [illegible], [illegible] (Are large for Penn, could they be Penn?) bed thickness = 29'
Collection 7/21/57/3
(Ran out!)






7/22/57

5.) Ls, w/ 30-40% chert (quartzite) pebbles - gray to gray brown weathering; a few ls. pebbles. 3' beds, from about middle of unit upwards, large ls. cobbles appear, a few bioherms are nearly sandy, coarse) ; 46' It should be noted that the upper 2/3 of this unit could probably best be called a Conglomerate. The ls. is nearly completely lacking except as cobbles in the upper half. About 5% or less of the upper rock unit is ls. cement.

6.) Covered for most part, exposures are congl., chert + quartzite, ls. cement. One big ls. block at 38' (Collection 7/22/57/2) 145' — I'm separating this as a unit only because of the weathering characteristic.

7.) Congl., poorly sorted to no sorting, chert, quartzite, ls. pebbles; some small cobbles - lime cement. Massive, cliff forming. Becomes coarser (small to med. boulders) upwards. 84', 1' to 20' beds.

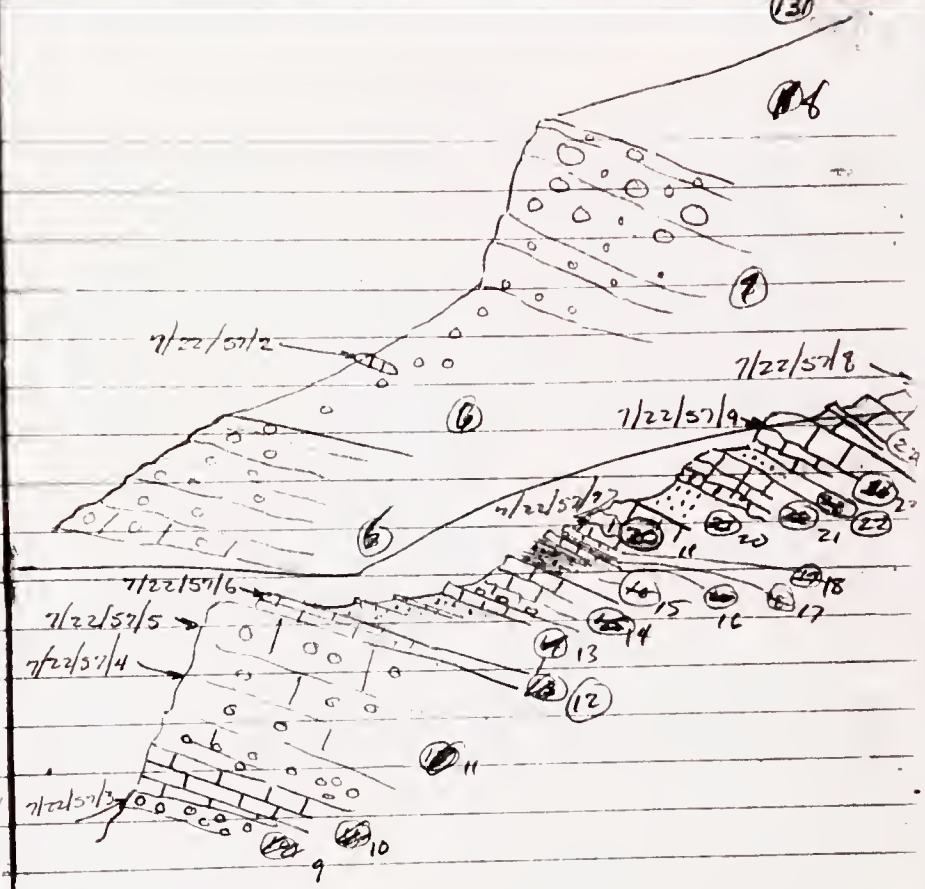
8.) Covered — 65' this is probably the extension to the west of the green gray shale + calcareous [illegible]

9) Congl.; brown + gray weathering. ls, chert, + quartzite pebbles, brown sands, not sorted; bare in places. 3' exposure. (7/22/57/3)

10) Calcarenite, dark brown weathering. zones of pebbles (10%) in calcarenite.
2" to 2' beds. Very irregular channels, widths of 1'-10'; 22'; have a flat top. Calcareous clastics are dominant.

11) Coarse [illegible] beds; [illegible] has [illegible] to make this a calcarenite but chert + quartzite [illegible] clastics. (with 3' covered) (7/22/57/4) 35' up (7/22/57/5) 43' up. This must become predominantly ls in the upper 10' (50%) has bryozoans, crinoid stems, + corals, besides the fusulines. I think it could be called near biohermal both — formation and position during Pma.
49'
Brown + dark brown gray weathering
Has blocks and small lenses of light brown silt which weathers out leaving vuggy appearance.






12) Calcarenite, med gray weathering; has granule size organic fragments, 6'
Collection 7/22/57/6 2' beds

13) Partly covered — apparently alternations of brown silt + sandstone and calcarenites
3 cycles - 6' - 6" to 1' ls.

Calcarenites in 12 13 have flat top
brown siliceous stained.

14 ~~B~~.) Congl, about 6' grading upwards a rubble of algal, sponge, & few foraminifera which may have been transported, crinoid stems 6'

15 ~~B~~.) Sandstone, light brown. 1/16" to 1/2" beds - 7'

16 ~~B~~.) Ls, Calcarenite, with organ frag granular ~~sy~~ 1'

17 ~~B~~.) Sandstone brown - 6"
note; here the calcarenite is irregular at its base & rests on eroded & weathered brown sandstone. (apparently the major break in sedimentation?)

18 ~~B~~.) like #16 2'

19 ~~B~~.) Ls, biohermal, gray weathering with brown congl chert pebbles. 7/22/57/7
6' becomes a calcarenite at the top (2') and a flat top surface w/ silicous iron (brown) weathering.



20 ~~B~~.) Sandstone, brown, like #15 - 4½'

21 ~~B~~.) Ls, rubble, with chert conglomerate, & Ls congl cobbles: grades into a calcarenite (upper 6" to 1') with a flat, siliceous iron stained upper surface. Coll. 7/22/57/9
~~B~~ 7½'

22 ~~B~~.) Sandstone, lt. brown weathering, much coarse calcite sand with the fine quartz sand. 2'

23 ~~B~~.) Ls, massive, brown and gray weathering chert pebbles, and Ls boulders scattered within. ~~—~~ 15'

24 ~~B~~.) Ls, mostly calcarenites - 4 cycles of rubble, through calcarenite, to flat top with siliceous iron stained; 21'; (at top 7/22/57/
top of ridge
50' NE of measured section a chert & quartzite congl has cut a 8' channel in unit #25. This congl appears overlained like unit 8 (in the lower part).

The conglo intervals 1 through 8, thicken NE ward toward the old iron dry hole. This is accomplished by a slight thickening of individual beds in that direction, but also by off-lap in what an apparently large channel is filling.




Sect. 8

[see p. 7 & 143, & p. 96 of Nb. 2]

~~Section 20~~ –

wolfcamp over Cue Gaptank angular unconformity. Gaptank strike N 75 W. dip 9° NE

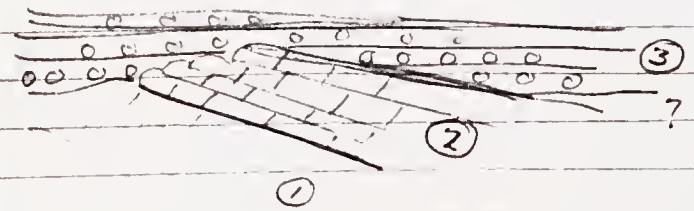
Collection 7/22/57/10 + 7/22/57/11 in gaptank at this point.

1.) Ls, yellow weathering, yellow-ocre, high % of silt, shot through with Calcite veins. 7/22/57/10; 30', covered below

2) Ls, biohermal, dark gray to mid-brown, yellow weathering silts, Chert pebbles + Ls. cobbles, 2 beds, 14' (coll. 7/22/57/11).

3.) Conglo., brown weathering. Cherts, quartzites, and gray ls., brown sand; This unit laps up side of a high (top) ... ½ bed and finally covers over the top. Strike NO. 30E, dip NW 11°

29'



4.) Sandstone, brown to gray-brown, weathers purplish, massive, + orange-brown
14'

5.) Congl. brown weathering; has sand of #4, cherts & quartzite (but little or no ls.) med. pebbles; has the dark weathering crust of #4 –
2nd day! replacement 6" to 4' beds
14'

Moved SW along bed 5 – 100 yds, to a point opposite bed

6) – Sandstone, brown to yellow-brown weathering, 1" to 3' beds, a lot of silt and fine to v.f. sand, some pebbles, poorly sorted
6'

7.) Congl., pebbles of chert, quartzite, + ls.; light gray-brown sand matrix 4'

8.) Shale, brown-gray weathering, a 5" brown weathering sandstone top, total 6' Coll. 7/22/57/12

9.) Congl. like #1 – 2½', with 2 interbedded 1" 8

10) like #8, with 2 – 3"–1" congl beds like #1
[8']



11.) Conglomerate, pebbles of chert, quartzite; brown sand matrix; weathers brown to brown-gray; beds, 3' maximum, appearance of 1' flat top of fine sands, 3'

Hueco Mts.

7/25/57: Van Horn area, Eagle Mts, east side. Calcareous [illegible] – shale [illegible] in. Hueco – [illegible] Cover 1/4 of outcrop – This is James Underwood's Texas area.

7/25/57-2 [illegible] Suggestive [illegible] (Dept.)

NC [illegible] NC of Eagle Range Hueco – [illegible] hill maximum, dark [illegible]

7/25/57/-3 (4 to 6' above 7/25/57/2)

The Hueco [illegible] several localities here: a) In Hueco [illegible] area in the Van Horn Mts the Hueco is a dark [illegible] in the [illegible] Eagle 800-900' b) In the Eagle Mts [illegible] Underwood's area – c) The Hueco [illegible] the Cover & upper [illegible] Cover [illegible] 1s (Colo?) [illegible]

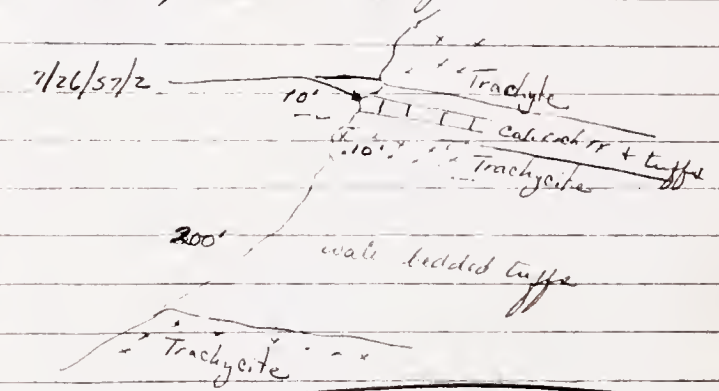
The Hueco appears in Page Swirl's area as a dark pitted dolostone; I claimed some and some gray ~~tan~~ I acts as silicified pseudo dolomite, but many all other fossils have been recrystallized and either completely destroyed such any structures; just outlines in the Van Horn Mts there is about 800-900 ft of Hueco - about 40-50' of Powwow Conglo and transition zone. It is similar to the basal conglomerate of the Wolfcamp & also contains siltstones and sandstones as possible of the equivalent to the Abo (as I saw, did not the same facies.) In Jack Underwood's area the Hueco is about ~~[illegible]~~ 600'-700' in the eastern locality (7/25/57/1) and perhaps thicker in the NE locality (7/25/57/2 + 7/25/57/3). These last 2 localities are near the base of the base of the unit but the exact horizon was not determined. There are some structure complications in this area and a more detailed work is need. The presence of siltstones & shales and sandstones in the first locality suggest the lower 1/2 & upper 1/3 are instream deposits having [illegible] like the middle 1/3



7/26/57

Coll. 7/26/57/1 from base of unit of igneous rock - above Boquillas Ls (K) - There is a possible freshwater Ls in pre-volcanic times. Black Peak east of Wylie Mt.

Coll. 7/26/57/2 - So. of Van Horn about 15; The 3 western, western most peak -




but rather are near the margin of the basin, probably the SW side. I've promised Jim to let him know what fossilines are from the 2nd & 3rd localities. In general a measured section in this larger region seems to promise little in the way of fossilines. See: Baker, A. & Pec. Bull 2745 (?)

[illegible] 9-5 [illegible] 987

7/27/57 — Wolfcamp bluffs above C. Ellis around area.

Collect. 7/27/57/1 — Uddenites zone W. side geologist's Canyon Saddle.

Coll. 7/27/57/2 — Float, near bed #22, section 4, see page 35

Coll. 7/27/57/3 — see page 52; bed 15, section 6.

~~Coll. 7/27/57/4~~ — Uddenites zone (biohermal facies) NE of windmill on main ridge.

James [illegible] (Robby) Moore, III Tex. Co. Research Lab. Houston, Tex. [illegible] examined many of the coal company fellows find the Glass in the Wolfcamp (Permian) part is equivalent in age to the Wolfcamp in the type area and eastward. Also that the Brachiopods and the fusulinids may indicate different ages in comparison to other areas.

Robby gave me a couple of samples from near Shafter, Tex. he believed of Permian age. They contain orthoceroids and a couple of molluscs of undetermined upper [illegible] especially Gerogeloceras.

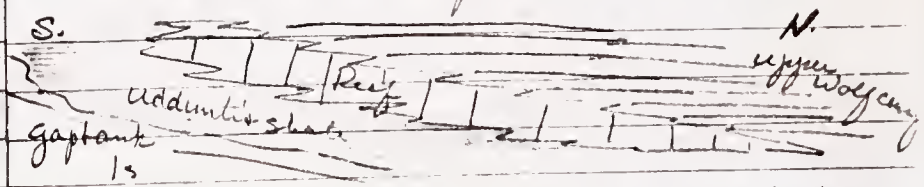


My thoughts on the cyclic bedding in the upper Wolfcamp are as follows at the present time:

1.) Downwarping of Wolfcamp from Basin to N. Deposits of gray to black shales and a few siltstones gradually filling edge of basin, but beyond "reef" facies.

2.) Biohermal activity encroached on this more or less flat bottom "mud" flat from north (to south) in a northward direction. This accumulating until wave action takes over control.

3.) The wave action sorted and reworked the later deposits of the biohermal deposits to reduce grain size, increase relative % of quartz and form common bedding in upper earth or so. By Pass was important and represents a considerable time of lost record. Repeat back to condition 1.




There is more to this than just this simple diagram. The contact facies change leaves room for more questions than I have answers at this time.

7/28/57 – [illegible]

Coll.: 7/28/57/1 – [illegible] So. of Marathon – Ellen Rock upper wall zone; Orbitolina texana.

7/30/57

Collection 7/30/57/1 – light gray shale beneath freshwater [illegible] in upper interval Calaum[illegible] + Sl. [illegible] 26 inches [illegible] Alpine. [illegible] – [illegible] Coll. [illegible] to Houston Pinell trip – [illegible] Big Bend Sunset Rock

Collection 7/30/57/2 – 1s part of freshwater sequence above.



7/31/57 [see p. 7 + 135, + p. 96 & No. 2]

Section 20, (cont.) – dip 10° NW

11.) Covered, 30', probably gray-brown shale for most part

12.) Calcarenite, greenish-orange-brown weathering, poorly sorted at base, includes dark (+ light colored) Cherts; vf. green quartz sand, Bryozoa, Crinoid + foraminifera frags. The lower part is near a granular or fine pebble conglo. Upper 4" becomes well sorted.

Collection 7/31/57/1

Wood frags common, bryozoans common. slightly undul. upper contact (3½')

13.) Covered, 13', probably gray shale

14.) Gray shale, with brown tinge: Collection 7/31/57/2; 5'

15.) Calcarenite, like #12; but conglo pebbles larger, 4½'; becomes better sorted (Coll. 7/31/57/3) and finer in upper 4"-5" flat top surface

16) Covered. 11', probably mostly gray shale

17) Calcarenite, yellow-brown weathering, becomes well cemented and with siliceous pebbles in upper 5", 1½', Coll. 7/31/57/4 from #12 and loose stuff, probably from shale just above and just below #17.

18.) Shale, gray to gray-brown, slightly silty 12'

19) Calcarenite, yellow-brown weathering; lower 8" are pebbly conglo. a ½" shale break and the upper 4"-5" are well sorted, evenly laminated quartz sand & calcite sand, fine size. flat top with an Fe oxide zone of v.f. sand size. 1'

20.) Shale, brown-gray, 58'
near top Coll. 7/31/57/7
near base Coll. 7/31/57/8

21.) Covered, probably like #20, may have several calcarenite (gray) ~~beds~~ beds. 26'

22.) Ls, mud. gray, with a large % (25-30%) cobble conglo. This might be best called a conglo with ls cement locally. beds are 2½' to 5' thick; 18'; Coll. 7/31/57/5



23) Covered 5', less resistant zone of bioturbation fine sand?

24.) Ls, massive, locally conglo (quartz, limestone + chert) med. gray weathering (see 6/24/57/2); upper 3'-4' bed is fine grained, flat topped. 25' Biohermal "Hess ls" of King
Coll. 7/31/57/10

25.) Ls, rubble, some conglo cobbles - lenses of 6" to 3' beds - contains biohermal junk corals, bryozoans, large foraminifera, bivalves
Coll. 7/31/57/6; 3'-5'
This unit thickens to about 8' to the SW just above the Kinkajou dens - (about 200')

Section 20 continued about 200' to SW above Kinkajou dens - followed at top of #24

25.(b) Sandstone, light brown gray grading up into a conglot. organic frag. hash. Has a well defined planar top with iron stains + cement. Tetracorals common, also Productid shell frags.; 8'

7/31/57 & 8/1/57

26.) Covered, 15', one 8" bed of siliceous pebble congl. exposed in middle of unit, rest is probably gray shale(?).

27.) A series of orange brown weathering, fine pebble congl., poorly sorted at base to well sorted at top, with flat upper surface - upper 2" are well cemented with $SiO_2$.

Coll. 7/31/57/9 at base

Several beds of siliceous v.f. sandstone or siltst.

10'

29.) Shale, (dark) gray brown - 3' Coll. 8/1/57/7

30.) Calcarenite, orange-brown, organic frag.; very fine pelletal size; crinoid stems, echinoid spines.

6"

31.) Shale, med gray brown. 2½

32.) like the beds in #27 - crinoidal fenestrina

6" - 1'

33.) Shale, dark gray 16'

34.) Calcarenite (with high % of chert pebbles too) grading upwards through calcarenite to quartz sandstone with iron oxide cement. weathers - light yellow [illegible] to a deep orange brown [illegible] top. 1" shale [illegible] top. 1½'



35.) Sandstone, weathers light tan to buff, grades into a siltstone and then into a shale. The finer shale is dark gray.

9'

36.) Covered 12', probably mostly dark gray shale

37.) Shale, dark gray and siltstone, weathers light yellow brown. These two lithologies grade back and forth horizontally as well as vertically 16' Coll. 8/1/57/6

38.) Calcarenite; dark gray (fetid); weathers orange yellow brown. fully fenestrina

Collection 6/24/57/7 1½'

Surface silicification of fossils; also the upper surface is flat, well sorted, laminar fine calcarenite with siliceous zones.

39.) Siltstone, light yellow-brown weathering; with lenses of calcarenite, rather well sorted but not laminated.

9½'

40.) Covered. 18'

Coll. 8/1/57/5 from a poorly exposed [illegible] middle - like #40.

40 41.) Calcarenite, light gray yellow, darker fragmental, fusulines, algal masses and other fossils. irregular lenses of tan siltstone in various attitudes to bedding - 3' 8/1/57/4

41 ~~42~~) Siltstone, finely laminated, yellow light brown weathering. Fracture upward into dark gray shale; 29'

42 ~~43~~) Calcarenite; organic frag.; bracks, bryozoans, crinoidstems; echinoid spines; fusulines. 1' 7/2/56/7

43 ~~44~~) Shale and siltstone; some mudstone, weathers in light yellow-brown); dark gray on fresh surface. 12'

44 ~~45~~) Sandstone, light brown weathering, med gray-brown on fresh surface. Has fossil frags. in lower part, very silty in upper part. 1'

45 ~~46~~) Shale and siltstones, light yellow-brown to med gray weathering. In upper 2' ft., lenses of organic fragmental ls appear. 27'



46 ~~47~~) Ls, organic frag., med gray weathering; tetracoral, large crinoid stems, bracks, bryozoans. Bottom irregular, seems to follow cut or eroded top of #46. The top of #46 is smoothly undulatory, siliceous upper 2" 8" to 1' (shows siltstone conglo toward drain)

edgewise conglo.

47 ~~48~~) Sandstone, v.f. grained, very silty; light gray-brown weathering; no apparent bedding irregular blotches of varying shades of color. 0-1'

48 ~~49~~) Siltstone, light gray brown weathering; sits on irregular top of #48, in one location rests directly on #47. Fills the trough so formed evenly and within 1½' feet is evenly bedded 14'

Coll. 8/1/57/2

~~Coll. 8/1/57/10~~

49 ~~50~~. Calcarenite, v.f. grained, weathers light bluish gray. Rich in brownish silt. Has a small-coiled cephalopod sample, see bed 38, sect 17. 2' (a unit like #51 between the 2 ls beds of this unit)

Coll. 8/1/57/11

50) Covered, 9', probably similar to #49

51 ~~50~~) Calcarenite and chert-quartzite Conglo. with one or two siltstone beds. 8' light gray weathering except for cherts + quartzite pebbles, rare ls cobbles med gray

SV 53) Ls, organic frag.; light gray weathering
Productids, crinoid columns; upper 2"
rich in siliceous cement + fossils.
2 1/2'

53 ~~54~~) ~~Covered~~, Alternation of limestones like
#32 and siltstones like #46, at least 4 alternations
interval is poorly exposed; siltstones have silicious
bands. 12'

A ~~55~~) Calcarenite, cobbles 3" to 6" diam; about
5% or less siliceous rocks in this unit.
8'

This seems to form the base of King's 1st Leonard Ls.

8/1/57/2, float found near bed 43. I believe it has come down from either ~~the layer~~ bed 50 or in the Leonard above.

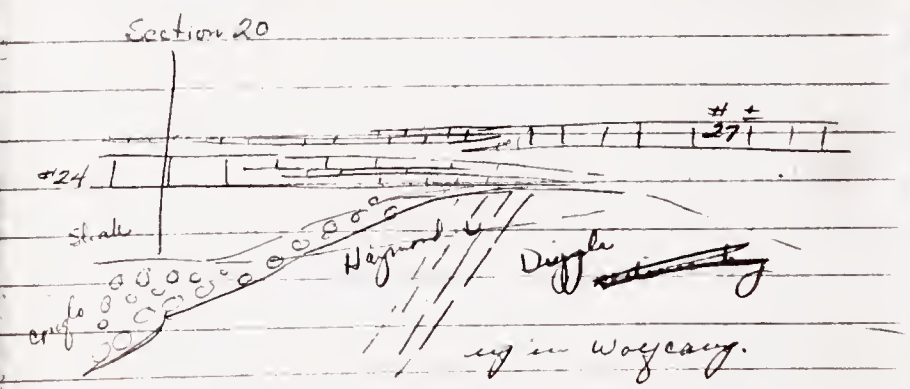
8/1/57/10 – NE of Section 20, 200 yds, from bed
#24 – one light colored black, grayer
ones are in matrix of rock



Afternoon (8/1/57) walked along Wolfcamp
interval to the NE about 1 mile. The upper
shale of the Wolfcamp is poorly exposed along
here and even the basal conglo of the Wolfcamp
is incompletely exposed.

The Dimple is exposed in a window (?)
in the Dugout Ck Thrust sheet. ~~and~~ Dimple
is the apparent source for much of the
lower Wolfcamp Conglo at this point.
Collection 8/1/57/8

Haymond ? is exposed just to the SW of
the Dimple; (8/1/57/9) is from sands + siltst
in Haymond.



Coll. 8/1/57/11 – These rocks are dipping slightly toward the town of Marathon, not a good exposure, but believe this is Gaptank thrust over Haymond onto Dimple.

The section on page 151 shows 2 limestone thickening & thinning. This is really cannot be a fault – throwing the NE side about 60 to 70' with respect to the SW side. The thickening and thinning of the Hess limestone & in sure does take place but perhaps not on the order of magnitude pictured on page 151.

The ~~Elkins~~ Canyon fault cuts the NE end of the Dean (Lennox) Hills. The lower Haymond is dropped on the NE side to a point below the Hess vachinella mem. The picture is complicated by several troubled or isolated fault blocks, in parallel to main fault system. Just south of Wendnell in line with the Sulphur Canyon fault, there is another or a fault – the NE side has black chert (Dimple?) faulted against Wolfcamp & or Gaptank orange brown sandstones.



The amount of cover NE of the place section 20 was measured obscures the geologic relations here. I believe the Conglo of the Lower Wolfcamp is moving apart and another out completely over the Conglo of Haymond and Dimple (Wolfcampian) Shales. The evidence is ~~more~~ negative because what I believe is Gaptank sandstone (orange-brown) has no conglomerate cover. The Haymond clays & sandstones are exposed very close to the Hess vachinella reef and no conglo is exposed typical of the lower Wolfcamp.

These faults according to P. King's map line up fairly well with the 3 that cross the Head of Cathedral Mtn. He maps the black chert as Ord. marathon "V" unit. The orange brown beds as Gaptank. They look much like some of the Ordovician. The Vincents are conglomerate. The Dimple cherts are present in great abundance in the conglomerate (see sample 8/1/57/) which may represent the lower or basal portion of the Wolfcamp.

Section No. 8 Ranch Road.

P. King has mapped the Hess as a normal fault about 50 to 75' down to NE with a fault. I believe there are several smaller faults parallel to the main one. I will run the section below the fault ~~the~~ not, but I believe the Lemont is faulted below the Hess at the fault and the Lemont chert zone is lower it. G. A. Cooper in "The West Texas Permian" Guidebook 1952 mentions that it seems to be Lemont.



8/2/57 Sect. 9

Section 21 - Sullivan Ranch Road at NE end of Lemont Hills. P. King called this interval Wolfcamp, I believe it is probably Hess. 0° dip for measurement.

1.) Ls, mud gray, more or less massive, forms lowest part of slope - 8/2/57/1

The lower 5' of this unit contains chert pebbles (fine) in well defined bedding band. Dev. + Ord. chert. Upper 1' is orange-brown well sorted; total 34'

2.) Covered, 34'; patches of light brown siltstone and sandstone crop out here + there in this interval but no definite relationships were determined. In the upper 15' several biohermal rubble ls appear to be present.

3.) Mud to dark gray Calcarenite; well sorted, upper 1/2" is dark siliceous rich. 1'

4.) Shale + siltstone, light brown 1'

5.) Ls, gray with a tinge of brown. Biohermal rubble - Crinoid columns 2" or more diam. 3" to 2' beds - total 5 1/2'

6) Covered, 7' probably mostly light brown shales & siltstones.

7.) Calcarenite, med. gray to orange brown, a few small pebbles near base, grades into fine sand near top. Upper 1"-2" siliceous ferric rich. 2'

8.) Covered, 25', this seems to be light brown shale for most part, some siltstones and some very fine sandstones.

9.) Ls, organic frag.; some black chert (Ord?) Crinoid columns, bryozoans, and fusulines. 1'-1½'
8/2/57/2

10.) Shale, siltstone, + v.f. sandstone; light brown weathering. 17'

11.) Covered, 27'

12.) Massive ls, light gray to light tan weathering. lower 6'-10' have large ls cobbles, small amount of fine chert pebbles. Coll 8/2/57/3
58' This unit has been dolomitized top of NE most knoll.

None used



Section 22 - NE of Sullivan Ranch Rd. starts between 2 windmills.
[no thesis sec. #] [see p. 129 No. 2]

Gaptank below is badly folded + faulted, Chert congl. breccia in the greenish chert, beds of chert below seem ~~to~~ well bedded + not excessively broken - Gaptank ls is present as well as brown sandstones.

1.) Congl., much chert pebbles and limestone cobbles. brown cement matrix. dip is about 15° N dip
20' become fine upwards, some organic fragmental material comes in. 2'-3' beds.
8/2/57/4

2.) Ls, med gray, mostly organic frags., some small chert pebbles. Crinoid stems dominant has brownish hue (weathered), Coll 8/2/57/5 about 20' up from base.
Coll. 8/2/57/6 about 60' up from base - thickness - 78'+ the upper beds dip S about 45 to 60°, I suspect this unit is faulted Leonard, a thin bit of upper Hess is #1 and no lower Hess or Wolfcamp at all. Leonard or Upper Hess resting on Dingle, Haymond Series and Caballos.

[illegible] section outcrop as far as the Decie pit. There seems to be no exposure of the rocks other than those in section 22. The green-brown sediments (Leonard?) are in a very light syncline or overturned anticline which trends near E-W parallel with the fault to Leonard. I believe the displaced rocks are faulted down to come in on trace this structure about a quarter mile.

The ~~[illegible]~~ Colorado breccia zone is quite thick here (40 to 50') and has an upper surface which appears time cut. It dips northerly to the N. ~~[illegible]~~ as much as 55°). This surface has since been distorted and is now cut by many 2nd order faults. The complete field relationships of these beds are unfortunately ~~[illegible]~~ concealed.

Coll. 8/2/57/7 - Blue shale 20' interval below Hexa 1s ledge, N45°W of Decie well now windmill.



Coll. 8/2/57/8 - Bioturmal or Bioturmal zone in base of wolfcamp Congl. (G.A. Cooper locality) almost due west of Decie well-windmill.

It would be nice to check the outcrops on the Dr. McRanch that P. King mapped as Wolfcamp. The Leonard Mt. section will have to suffice.

Why should P. King have missed this important structure by the Sullivan Ranch Road? Probably didn't walk over it (?)

---

8/3/57 Shipped 138# of rock specimens in 3 sacks, the heavier two were double gunny sacks.

End of Book one 1957

Typed from original by C. Ross in 2002 ±

doc. 315

C.A. Ross
Peabody Museum
Yale University
New Haven, Conn.

FIELD NOTES
BOOK 1

Marathon, Texas, Summer 1957

Study of
Wolfcamp Hills and Wolfcamp sediments
along south front of Glass Mts. -

C.O. Dunbar visited me on the field on the
22,23,24 and 25th of June, 1957.

June & July, 1957

PG. 1
6-22-57
(Neal) Taylor Ranch-Wolfcamp Hills-Sunny-Warm.
Collection-6-22-57-1- Upper of P.King bed 2- point over Geologist Canyon- 200 yards north of Uddenites Saddle.
{note: illustration: P.King's Bed 2:
layer 1: 20'
layer 2: 4'
layer 3: 6'
layer 4: 4'}
Collection 6-22-57-2- From about middle of P. King bed 4- 100 yards east of turn of Creek Geol. Canyon.

PG. 2
Hess is a limestone sequence and under lies the Leonard which is siliceous-The Leonard just beneath the sill and top of Wolfcamp is calcarenites, and often very silty- well bed. The Hess Conglo. is "white".
The western end of the Wolfcamp looks like a good place to measure the Hess Conglo. and to determine fusulinid sequence in the Lower Hess (or Leonard) - Check this section against the conglo. sequence on the north fork of Geol. Canyon. Question to think about: What is the nature of the cyclic deposition of the Wolfcamp sequence? The limestones start off with rumble and then go up through clastics which become finer and finally are present as finely laminated sand (calcareous). These laminae are similar to the individual sets of beach deposits in Lyons Ss. What cause cycles? What conditions changed to cause deposition of Hess Conglo. and Leonard silt and claustic beds?

C.O. Dunbar and I drove around east end of [Wolfcamp] Hills and got back side-road not so good. Walked the eastern exposure of the upper Wolfcamp (P. King beds 4 to Hess Conglo.).

PG. 3
The fauna needs to be studied from various points along the same bed for the length of exposure. Reef nodes form in great abundance on P.King's bed 9 to 12- this cause uneven, distorted, limestone ledges just above-result of differential compaction.

PG. 4
6-23-57
Cool in morning, sunny, some haze-dusty and hot in afternoon. Regional showers in late afternoon.
Went to Hess Ranch and to spur of ridge around which road winds- C.O. Dunbar explained section to top of ridge roughly as follows.
{note: illustration: "Hess Conglo.":
bed 1: 75' or more, chert and limestone pebbles conglo.
bed 2: 60' +-, 6-23-57-1, fossiliferous limestone (Wolfcamp)
bed 3: 100' +- dolo.}
The age of the dolo is questionable - The "Hess" Conglo. has Wolfcamp fusulines overlying it- so that the conglo. is apparently one of the Wolfcamp series.
The possible correlation of the above section with that of Leonard Mt. needs to be definitely worked out.
6-23-57-1- Spur above Hess Ranch Home- just east of fault, about 15-20 feet below base "big dolo" ledge (about 10' below "rusty" layer).

PG. 5
{note: illustration: "Leonard Mts. Section":
bed 1: Slump? Fault?
bed 2: Gaptank? Uddenites shale - G.A.C. has _?_. (This probably from Talus slopes- not much strat. value)
bed 3: Wolfcamp. Conglo, _?_
bed 4: Limestone beds
bed 5: dolo
bed 6: This is loaded with Fusulines.
bed 7: Leonard?
What happens in the lower part is really a question, beds are mixed up, short horizontal exposures and great variances of dips.
"Wolfcamp" of King - Tenus}
Uddenites Shale- east side of Geologist's Canyon 6-23-57-2.
6-23-57-3- West flank of western main reef noted in P. King's limestone 2 due north of Neal Ranch.
{note: illustration:
North side = 20'; Well bedded, limestone, which thin between reef heads to about 20'.

6-23-57-3; cobbles of limestone and organic fragment debris - Bryozoans, Dictyoclustous [brachipods], Crinoid plates.
South side = 80'; Massive reef head in P.K. bed 2.}

PG. 6
Uddenites zone- Brown weathering material in limestone- what is it? Section along face of Mid Hills {note: illustration: Uddenites member:
Upper Gaptank limestone of King. #2 limestone in between west and east section.}
Note the great changes in thickness of the Uddenites shale- The contorted bedding of the upper Gaptank limestone, the biohermal nodes and variation in thickness of other beds- Trace these out and try to find out if the Uddenites member is along a facies, a time units, which may have been deposited as the Gaptank was being deformed, time of deformation- what is structure of this? joints? what about joints? about the draped limestone over the higher biohermal developments?

PG. 7
6-24-57 Sect. 8 (part)

1st limestone ledge about 20' above top of Wolfcamp Conglo. in Section Carcajew nest in Lenox Hill- ref. C.O.D. 6527/34 collection 6-24-57-1 is in same horizon as his- see also 8-12.
6-24-57-2- From same section as -1; This is from a large block of limestone. 3'x2' in the Hess ledge- The ledge itself is a Sacchinella- Leptodotus reef with medium boulders of various rock types in it. This block from which this sample is taken is apparently on edge in the rubble of this reef. {note: illustration:

bed 1: 6-24-57-3 (8-24); crumbly limestone (with some clay) with pebbles.
bed 2: 5'; dense well bedded limestone.
bed 3: 5'; gray.
bed 4: 8'; vuggular limestone (Carcajew nests).
bed 5: 15'; massive reef breccia.
bed 6: 5'; bedded limestone.}

The exact base of the Hess is questionable here- any of these lower 3 contacts would be acceptable.

PG. 8
{note: illustration:

layer 1: 6/24/57-3 (8-24); (1) a gray limestone with fine to medium pebbles and abundant crinoid stems and shell fragments.
bed 2:
bed 3: dark gray, thin bed shale, 1' shale, is like (1)
bed 4: 8' thick (like (1))
bed 5: dark gray, thin bed shale 0'-3'.
bed 6: 6/24/57-4 (8-24); limestone lense.}

The fusulines in -4 are possibly weathered out from lower horizon and redeposited in pockets in the reef facies. C.O.D. believes these are at least superficially similar to those of collection - 3.
The contact between the massive cliff forming and the underlying could be either a cut surface or a squeezed surface. The way the lower limestone units in the siltstone lens in and out would suggest a facies change and not a great unconformity right at the base of the Hess ledge.

PG. 9
Collection 6/24/57-5 - at the base of Upper Hess Ledge, 250 yards south of gully 1st head lg. which follows down Carcajew section. Unit 53, Section 8.
Collection 6/24/57-6 - a fossiliferous (8-37) horizon in Hess which is 1/2 way more or less (80') above the basal Hess Sacchinella limestone. This interbedded with the siltstone, sandstone ($CaCO_3$) iron - chert stained.
Collection 6/24/57-7 - slabs of a fusuline and shell cochina-45' +/- above top of Lower Hess Sacchinella limestone reef at Carcajew section.

PG. 10
Gaptank type area. Clear and sunny.
loc 1 6/25/57-1 Collection from a limestone within the upper Gaptank conglo. of P.King on or close by to the type section.
loc 1 6/25/57-2 Collection on back northeast slope at top of P.King Upper Gaptank conglo. unit.
loc 2 6/25/57-3 10' above Collection 2 - 6' or 8' of brownish weathering nodular limestone with interbedded yellowish shale-beds above are sandy (brownish-red).
loc 3 6/25/57-4 about 80' above Collection 3 in what we believe is P.King's (this maybe his #2 limestone however). This is #2! light gray to white limestone with occasional light yellow patches.
loc 4 6/25/57-5 near top of P.King's #3 limestone- In one of many gray limestone shell cochinas. This slope has some loose fragments on it which are included in collections.
loc 6 6/25/57-6 10' to 15' below base of P.King's #4 Gaptank limestone - in a brown and gray weathering limestone.

PG. 11
loc 7 6/25/57-7 Collection taken at base of what we believed is P.King's #5 Gaptank limestone.
Drove C.O. Dunbar to Monahans to get Santa Fe for Dallas.
C.O.D. seemed pretty convinced that the Gaptank is Canyon in age and not Cisco. Suggested that Uddenites might be a Cisco equivalent and he said yes that was what the fusulines pointed to. He didn't know whether the #2 limestone of King's might not also be Cisco also- The problem of the conglomerate pebbles in limestones came up again. This is a good point-Ref. to Australian paper might be good here.

C.O.D. wants more collection from the upper Gaptank in type locality. Also a close study of the Wolfcamp and Uddenites zone in that region.

PG. 12
6/26/57-1
Wolfcamp Hills- east end.
Studied the "Dolomite" sequence at east end of the hills- The eastern most ridge is composed of limestone, the dolomite if present is limited to one or two narrow bands. The limestone is a more or less typical biohermal deposits, very large amounts of crinoidal debris and brachiopod shells, a few echinoid spines. Fusulines are few and are rather rare over in what appears to be pockets.
Collection 6/26/57-1 is from a smooth weathering limestone band about 8" thick within the upper 2' off the massive face forming limestone, This is over lain by about 2' of unevenly bedded limestone and dolomite. The dip of the massive limestone and the unevenly bedded layers is S70E.
Much of the slope to the SE of this narrow ridge appears to be rotated and slumped. The Uddenites beds are exposed.
Collection 6/26/57/2 and 3 {note: illustration:

bed 1:
bed 2: 15'
bed 3: 7'
bed 4: 4'; Collection 6/26/57/2
bed 5: 9'; 6/26/57/3}

PG. 13
This collection (2) is from the 2nd limestone highland from the eastern end of the Hills. The pocket from which these fusulines came is rather thin but of considerable horizontal extend.
The stratigraphic interval between 1 and 2 appears to be only about 12' above collection 6/26/57-1, but the relationships are obscured by discontinuous bedding and rubble of these 2 biohermal masses.
6/26/57/3- From the highest portion of the 2nd bioherm on the east end of the Wolfcamp Hills. This collection is about 12' to 15' stratigraphically higher than (2).
6/26/57-4 west side of 2nd biohermal reef. {note: illustration followed}

PG. 14
6/26/57/5 - Collection is from uppermost limestone ledge in what will be tentatively called the Uddenites Member, just west of the 2nd biohermal high.
{note: illustration:

6/26/57/5 - Brown-red even surface; Brown shale.}

6/26/57/6 - This is collection from a fusuline horizon in brown-yellow weathering band at the base of the apparent upper Uddenites limestone bioherm (near the middle of the eastern sector in a wind gap.)
6/26/57/7 - Collection from Uddenites zone, 200 yards south of western end of disembarkment at east end of Wolfcamp Hills. The #2 limestone bioherm of King

has beds dipping near east at this point and many blocks of this limestone have slipped down to cover the contact. This Uddenities bed is high in the zone and is a gray nodular limestone with interbedded brown and rust weathering siltstone. The calcite in the original rock has been recrystallized, probably as a result of the post-deposition

PG. 15
fexture at this end of the hills, lowering the eastern end.
6/26/57/8 - Collection from brown weathering brachiopod and fusuline coquina limestone, about 25 feet stratigraphically below 6/26/57/7. {note: illustration:

bed 1: 3'; 6/26/57/8
bed 2: 15'; gray shale
bed 3: 1'; Brown ironstone
bed 4: 10'; Shale? gray
bed 5: 2.5'; 6/26/57/7}

The east of the Hills are going to present problems in covered intervals and erratic discontinuous deposition.

PG. 16
6/27/57 This was one hell of a hot day.\
Section 25
Wolfcamp hills - Measured Section-1 Sec 25
S15E° to water windmill at Neal (Taylor) Ranch
S85E° to water windmill at tank east of Ranch
Gaptank
1) Covered below
2) (uneven 6-8" beds). Limestone, weathers gray to yellow-brown, a shell hash of brachiopod and fusuline frags; 5.5'; Collection 6/27/57/1 (dip 16°)
3) Covered, probably shale which weathers gray brown, 37'
4) Limestone, gray to yellow weathering, lower portion (2') 3-4" nodular beds, upper portion in uneven beds 2-4' thick. Thin bands of interbedded brown shale - 17', organic fragment. Collection 6/27/57/2, Top Gaptank.
5) Covered - 57' probably gray shale with a few rusty yellowed? sand-siltstone layers, no definite bedding could be distorted.
6) Limestone, rusty weathering, Crinoidal fragments are dominant, some pockets of fusulines are present - 8'. The upper portion of this layer has black limestone pebbles in it, but have no fossils.

Collection 6/27/57/3 - one block which contained a good fusuline fauna may be from higher in the section.

PG. 17
7) Covered - probably shale 52'
8) Limestone gray, weathers light brown, lower 11' are rubbly becoming better bedded into undulating 3-4" layers: Upper 13' massive in 3-4' beds, biohermal limestone. The shell fragments are dominantly brachiopod and crinoids, total 24', Collection 6/27/57/4.

9) Covered, 5', probably a weak limestone.
10) Limestone brown weathering, slightly sandy 7', Collection 6/27/57/5.
11) Limestone gray to brown weathering 5-60'. (note: illustration:
bed 1: 6/27/57/4
bed 2: 5'; 6/27/57/5
bed 3: 6/26/57/5
total height 60'}
The upper surface of #11 unit has a 1/2" limonite stain on a relatively recent exposed surface.
{note: illustration:
Reef 1: Reef 2 what I believe is probably equivalent to P. King Bed 2.}

PG. 18
The formation of Reef 1 precedes that of Reef 2 and the debris from Reef 1 sloped toward the southeast. The relations are not completely clear but the debris from Reef 2 appear to rest on the truncated edges of Reef 1 debris, suggesting that Reef 1 had a greater extent to the northeast but was removed before Reef 2 came into existence.
Top of Uddenites
12) Covered 27' probably soft limestone
13) Limestone gray weathering, a biohermal hash. #2 limestone? 17', in 4-5' massive beds
14) Limestone nodular, dark gray, weathers to white. 5-25'.
15) Calcarenite, yellow weathering- Caps 14 but intertongues with it {note: illustration:
bed 1: 13
bed 2: 14
bed 3: 15; 7'
SE}
16) Limestone yellow-buff weathering - 20 feet, collection 6/26/57/4 is from this interval-- Top of Ridge -

PG. 19
Section 24
Section II about 200 yards southwest of section I.
1) Shale, dark brown, bottom of interval not seen, top not seen, estimate 100-125' thick.
Collection 6/27/57/6. [Gaptank shale is considerably thicker here than at type section?]
2) Limestone, dark gray, limestone rubble at base 8', massive limestone ledge 3' (Collection - 6/27/57/7) at 33' above base of 1st ledge - Collection 6/27/57/8 (24-2B), this unit became progressively more shaly in the upper part. Total thickness of this unit is 74'.
3) Limestone, gray; brownish-yellow weathering-indistinct nodular bedding in lower 8' of this unit. Collection 6/27/57/9 at base- 33' massive limestone with one

2' band of nodular limestone about midway in unit. Total thickness 41'. The upper part weathers gray on top.

- Top of Gaptank - Base of Uddenites

4) Covered 12', probably brown shale.
5) Limestone, light gray with interbedded brown siltstone - Crinoidal, dark. 5' occasional brach. fragments.

PG. 20

6) Covered - 9', probably gray shale and a few brown siltstone bands
7) Limestone, brown weathering, bedding 6", uneven surfaces, Crinoid, brachiopods and a few fusulines. Collection 6/27/57/10 (24-7) 8'.
8) Covered - 12' probably lime nodulars in a clay or silt, some brown colors.
9) Limestone gray, massive
    a) fusuline and brach coquina in a 6" band at base, Collection 6/27/57/11 (same horizons as 6/26/57/6).
    b) Massive limestone ledges 4-6' thick.

These form the dip slope and seem to be about 10' below what I believe is P.King's limestone #2 bed. 12' thick (?)

PG. 21

In the afternoon of 6/27/56, I drove northeast from the Wolfcamp hills to a tank (about 1.5 miles). From there I walked slight west of north to the low outliers of the Wolfcamp and Hess as mapped by P.King. I found silt and sandstones with even bedding exposed in a gully. They would suggest that the conglo. Hess at Wolfcamp Hills is only a local bed or lense. The sandstones are medium lamellae- 1/8" to 1/16" and have abundant tube (or fecal castings) of worms - one I measured was 5" long, 1/4' in diameter and near straight.

- About 2' above this silt and sandstone sequence in the rubbly part of the limestone. I made Collection 6/27/57/12. It looks like what C.O.D. said Schubertellia Kingi would look.
- 4' above collection 6/27/57/12, I found a brown shale- it had a few streaks of red-brown at the top and some gray in patches- Collect 6/27/57/13 from shale.

PG. 22

At this time I'm not too sure of the data, but the deal about shifting and eroding reefs maybe a partial answer to the big picture. Perhaps in well logs we could get the needed 3D perspective on the facies shifts. After briefly looking at the lower Hess, I wonder at what silt, sandstones and cemented siltstones, with a few interbedded limestones might mean with relation to the cyclic Wolfcamp and the irregular and peculiar Uddenities zone. The phases of the biohermal growth in the Wolfcamp must have had other types of deposits elsewhere - could they not be represented in either the Uddenities facies (no because of fossils?) or the lower Hess (which is not well known faunally).

The Hess section I saw in the afternoon needs to be restudied in greater detail. The massive cliff former in the hill is probably all Hess, but King reports some Wolfcamp and so the face of the hill needs to be studied.

PG. 23
6/28/57
Section 23
Near Center of WCHs

Section III in a line N30W of Taylor (Neal) Ranch
1) Upper Gaptank limestone - same unit as 3 in section II. Here it is less massive, about 8', with the middle nodular zone of unit 3 in Section II thickening up to at least 10', about 12' more is covered and it looks as if the lower massive zone of unit 3 section II is either missing or is nodular here. The upper 2-3' is a nodular limestone in 6-8" layers - becomes sandy. {note: illustration:

bed 3: 13'
bed 5: covered-12'
bed 6: 10'
bed 7: 8' to about 5'
bed 8: 3'; Collection 6/28/57/1 (23-1)
Top of Gaptank
bed 9: covered}

PG. 24
2) 34' covered - probably a gray shale -
3) Limestone, brown weathering, gray on fresh surface- This is an organic fragmental rock of brachiopod and a few coral frags. The lower bedding surface of this unit contained pockets of fusulines. Collection 6/28/57/2; 3'.
4) Covered internal - 23'.
5) Limestone yellow brown weathering, in beds 4-8", Crinoidal and fusuline coquina here, 50' to the west of the unit becomes massive and composed only of crinoidal fragments. Collection 6/28/57/3 is from base of this unit. Collection 6/28/57/4 taken 20' above base of this unit. The upper part of this unit became massive and is probably a bioherm. It tails off in both east and west directions into thin beds at the top of the western bioherm and thin beds at the base of the eastern bioherm, 33'.
6) Covered - 8' probably gray shale- Heightens to 12" but this depends whether it is between bioherms or at the top of one.

PG. 25
7) Limestone, gray weathering, I take this to be the base of P.King's #2 limestone. This is a fine grained calcarenite at this point. The 2 feet of rubbly material below the base of the unit has a fusuline fauna (Collection 6/28/57/5) 4' thickness of unit. {note: illustration:

bed 1: 6/23/57/1
bed 2: covered-34'
bed 3: 3'; 6/28/57/2
bed 4: covered-23'; 6/28/57/3 (23-5A)
bed 5: 33'; 6/28/57/4 (23-5B)

bed 6: covered-8'
bed 7: 6'; 6/28/57/5 (23-7)}

PG. 26
Collection 6/28/57/6 from a brown weathering biohermal limestone in the Uddenities zone. This is approximately midway between the base of P.King's #2 limestone and the top of the Gaptank limestone- The Uddenites zone is badly covered here- This section is in line with the road down to the Ranch House S55°E, I estimate the thickness to be 85-95'- The outcrop from which collection 6/28/57/6 is about 8'.

Afternoon- West of Main Hill {note: illustration followed}

PG. 27
The outward appearance of this is quite misleading. The Gaptank limestone forms an anticlinal structure under the western bioherm of the main #2 ledge- The Uddenites zone and a part of the biohermal reef have slipped as a unit down one of the lower Uddenites shale bedding planes. The mass now rests in a structural valley of the Gaptank fm. The eastern side has moved the furthest with about 175' of displacement, the western end is more or less hinged about a point.

Collection 6/28/57/7- about 6' below top of Gaptank fm - east side of Geologists Canyon- On the east side of Geologists Canyon, the "window" which C.O.D. pointed out on the first day is most confusing. I have some doubts as to whether it really is a "window" structure. The Gaptank does some fancy folding at this locality and it seems that the Uddenities zone is missing and the #2 limestone of King sits directly on Gaptank limestone.

PG. 28
The Uddenites zones if present is only a foot or so thick, but probably is represented by little more than an erosional bedding plane. The fossils present are dominantly crinoids and a few brachiopods and are now a red chert or silica. This area is quite important and it will pay to study the fauna as carefully as possible to determine age relationships. The dips and questionable faults also may have some importance on the regional structure of the fate Penn.

6/29/57 - Drove to Alpine and got a haircut and the brakes tightened on the car. Did some banking for Mr. Fallis also. Sent off 2 bags of rock specimens to Peabody Museum on this date also. Railway Express-COD-100lbs. total.

PG. 29
6/30/57
Section 22

Geologists Canyon-Section IV

Collection 6/30/57/1- P.King's gray limestone (#2 bed) in creek floor. Covered below.
1) Limestone, gray weathering 6"-3' beds, most crinoidal fragments and some other organic fragmental matter. 31'. The upper portions of this unit have progressively large limestone boulders in them, most of the upper 6-7' is composed of limestone cobbles 3" in diameter in a limestone matrix. The upper most foot loses the large limestone cobbles - The few pebbles found on the upper bedding surface are about 1" in diameter. (6/30/57/1 is from the lower 3' of this unit). Collection 6/30/57/2 is from upper 3' of this unit.
2) 8' covered-probably gray shale. Collection 7/1/57/10.
3) Limestone, conglomerate. 1/2" to 2" diameter pebbles, well rounded, little if any chert pebbles - some crinoid stems, a productidae - brown-yellow weathering. Collection 6/30/57/3. 4'.
PG. 30
4) Covered 7' black to bluish shale in lower part.
5) Limestone, conglomerate yellow-brown weathering, upper 1' is sandy and organic fragmental. Flat bedding plane on top. Bryozoans, fusulines, crinoids common on upper surface. Collection 6/30/57/4, 3.5 feet.
6) Covered, 44' one or two 4-6" brown weathering sandstones are probably interbedded in a shale (gray?).
7) Limestone, conglomerate and rubble at base grading upward into organic fragmental and finally a sand layer (well laminated) in the upper most 3-4". There is apparently a shale parting between the rubble-conglomerate portion and the organic fragmental-sand portion.
Typical flat top bedding plane. (6 feet +- ?).

PG. 31
{note: illustration:
bed ?: covered
bed 7: Collection 6/30/57/5 and 6/30/57/6 (shale parting)
bed 8: 6/30/57/7
bed 9: 6/30/57/8 and 6/30/57/9 and 7/1/57/9}

8) 2' - of which the lower 1'8" is a rubble of crinoid parts - upper 3" fine grained, laminated sandstone ($CaCO_3$ + much silicification) - a 1" shale parting separates this litho.
9) a.) shale grey-grading into crinoid coquina and 1" diameter pebble which forms a rubble 2.5'.
b.) Repetitions of 9a 1.5' followed by shale parting 1".
c.) Fine coquina grading upward into a coarse ss, laminated with flat upper surface 2'.

PG. 32
10) Covered 30' - brown to gray shales probably
11) Limestone, orange-brown weathering - another cycle like unit 5 or 7. 4', Collection 6/30/57/10 in top portion of unit 11.

12) Covered 13'
   b) then a 4" brown ss; fine crinoid sizes in ss.
   c) 10' covered
13) Orange-brown calcarenite - fine grained planar upper surface - no rubbly 2nd layer observed {note: illustration:
   bed 1: 4"-6", lamillar shelly zone
   bed 2: 2"-3", reworked shell zone
   bed 3: 3", fine ss lamillar
   Top of (13); 6/30/57/12}
14) Covered 7'.
15) Limestone, brown-yellow weathering irregular bedding, but with 1" top zone of fine ss nearly planar. 6".

PG. 33
{note: illustration:
   bed 10: 4" ss (Cal.; 7/1/57/8
   bed 11: 6/30/57/10
   bed 12: 7/1/57/11 and 6/30/57/11
   bed 13: 6/30/57/12

   bed 13:
   bed 14: 7'
   bed 15: 3'; 6/30/57/13
   bed 16: (16a), 5"
      (16b), 1'
      (16c), 2'; 7/1/57/7
      (16d), 1.5'; 6/30/57/14}

PG. 34
16) a) 3' gray shale
   b) 5" brown calcarenite bed
   c) 1' gray shale
   d) 2" brown calcarenite bed
   e) 2' gray shale
   f) 1.5' calcarenite sandstone
This is a typical top sand and rubble limestone
17) Covered - 25' gray shale?
18) Limestone, the typical planar top surface and shell coquina below - 2' total. Collection 6/30/57/15.
19) Cover 7' Shale?
20) Limestone with some chert pebbles - brown weathering and not so yellowish as most: A conglomerate (pebble) at base of this is Collection 6/30/57/16 (6") The finer grained, sand (calcarenite) is Collection 6/30/57/14 (4")

PG. 35
{note: illustration:

bed 16:
bed 17: 6" to 1'; 7/1/57/6
bed 18: 6/30/57/15
bed 19: 7/1/57/5
bed 20: 6/30/57/16
bed 21: 6/30/57/17 and 7/1/57/4 and 7/1/57/2
bed 22: 6/30/57/18
bed 23:
bed 24: 6/30/57/19}

PG. 36
25) a) Covered 16'
b) brown ss much like 12b, with small crinoidal debris
c) shale 12', with one 3" brown ss band like 20.
26) Limestone brown weathering, shale beneath- 1.5', sample 6/30/57/20
27) Shale, covered in part, 3'
28) Limestone orange-brown, few fossils 1.5'
29) Shale, yellow to orange with a few siltstone layers - 22'. Collection 6/30/57/21 (a+b)
2 sacks. Brown weathering limestone-sand near base.
30) Covered 11' probably more of 29 shale, +- 266'.
31) Hess Conglomerate.
continued, bk2p

PG. 37
{note: illustration:
bed 24:
bed 25: a) 7/1/57/3
b)
c) 7/1/57/2
bed 26: 6/30/57/20
bed 27:
bed 28:
bed 29: 7/1/57/1
a)+b) 6/30/57/21}

PG. 38
7/1/57
Took shale sample from Section IV
7/1/57/1 to 7/1/57/11 as marked on Section IV
7/1/57/12 in lower 20' of Basal Hess Conglomerate in creek bed of Geol Canyon.
These are cobbles and boulders for use in determining source.
7/1/57/13 Sample of conglomerate Hess, upper 10'.
The Hess Conglomerate is about 35' to 40' thick here.

PG. 39
7/2/57

Mr. Jarvis and his assistant Joe? went into field with me. Looked over lower section on West flank of WCHs. Mr. Jarvis spotted a fault? in west end of WCHs better check it because it looks as if #4 in drop to Uddenites Saddle. {note: illustration:

bed 1: covered
bed 2: 7/2/57/2; 27'
bed 3: 3'; 7/2/57/1
bed 4: 11'; Uddenities zone
bed 5: 5'; King's gray #2 limestone
bed 6: 1.5'
bed 7: 2'
bed 8: 1.5'}

PG. 40
CR's Section 20 (GSA M.88)
Section V West end of the WCHs proper - measured N20W from outlier [about 300 yards west of King's Sec 24].
Below covered by out wash - Uddenites zone probably.
1) Limestone conglomerate, with crinoid and brach frags., conglomerate cobbles 1' to 4" diameter. 16', gray outcrop - top surface is near flat, has an inch zone weathered brown. Many of the crinoid stems are relatively unbroken and probably have not had a great deal of erosional transport.
2) Covered, 25' - seems to be an interval of gray shale and brown weathering calcarenite.
3) Calcarenite - Brown weathering, lower surfaces appears to be a disgested ss [burrowed]. The upper surfaces are finely laminated - 4-6" beds of ss with interbedded silts and clays, 5'.
4) Shale, blue-gray in part covered 12'.
5) Limestone, similar to #1 below, pebbles are 1/2" in diameter however; Near top is a good fusuline zone - this horizon divides vertically to the west - the upper part forming King's bed "4", 16'.

PG. 41
{note: illustration:

bed 1: 16'; 7/3/57/1
bed 2: 25'
bed 3: 5'
bed 4: 12'
bed 5: 16'; 7/3/57/2; Top of King's #2 (gray) limestone(?)
bed 6: 163'}

6) Covered 163' - How many beds are covered here is only guesswork - The value of this interval is of comparative proposes only.
7) Limestone, massive gray weathering, a shell hash which shows very little transportation. Coral, (long slender tetracorals), bryozoans, isolated fusulines, brachiopods, crinoid stems.
lower 18' massive - upper 5' in 6" to 1' beds. 7/3/57/3 total 23'.

8) Covered, 21' - shale?
9) Limestone, blocky - yellow-brown weathering, 6" to 1' beds, 2.5' to 3'? - Can't see any rubble base, top is planar, but lacks lamella upper 2' or 3'. Shell hash.

PG. 42
{note: illustration:
bed 6: 163'
bed 7: 23'; 7/3/57/3
bed 8: 21'
bed 9: 2.5'; 7/3/57/4
bed 10: 2'
bed 11: 6/3/57/5
bed 12:
bed 13:
bed 14: 7/3/57/7}
10) Covered 2'
11) Limestone, same as 9, 8-12"
12) a) shale ? 6" to 1'
b) rubbly, conglomerative (1/2" to 1" pebbles) organic frag. Limestone 2' (silicified fossils common)
c) Limestone, coarse size organic frag. even top bedding surface 2'.
The beds above 12 form irregular steps on the dip slope to the NNW. Biohermal deposits cause the irregularity in the 6" to 2' beds - 15' to 20' of strike on the dip slope of this ridge which are above bed 12 and not covered by alluviam.

PG. 43
Fault strikes N15W - 25' strat displacement east apparently lowered. This fault is 100 yards +- east of section 5.
This afternoon I tried to traced bed 11, section IV around to section V. Bed 11 is eroded away about in line with place where the lower part of section gets mixed up at the first turn in Geol. Canyon. The upper surface of bed 11 is nearly completely covered with fusulines - The next lower limestone coquina in Section IV, bed 9, I don't believe has this great population of fusulines. After losing bed 11, I drop down to what I believe is bed 9, at least the stratigraphic interval is about right. Then to bed 8? back to 9? then a biohermal limestone, then a crinoidal limestone, finally to a limestone with a reasonable number of fusulines 11? About 300 yards from where I first lost 11. If this bed is #11 of section IV then it is about 15' to 20' higher with 2 additional limestones in between. Perhaps several more. (ie, a chert separating 2 from vuggy zones, caped by a limestone).

13) Covered 4'
14) Limestone, brown-yellow weathering, silicified fusulines and gastropods, some echinoid? spines.

PG. 44

This unit 14 is what I believe is equivalent in lithologic connection to bed 11, section IV.

PG. 45
7/3/57
Morning went to Alpine to see about some photographs; SCS didn't have very good ones, so sent for U.S.G.S. photos.
Sampled from Section V
7/3/57/8 - a rock sample from about 100 yards east of section V, from the third unit: at this point unit 3 is dipping 26° S45W. It is truncated by unit 5 which is dipping about 10° N45W.
7/3/57/9 - from Uddenites zone west side of Geologist's Canyon, loose specimens. I believe the gonatities are fairly high, pelicypods also.
7/3/57/10 - from top of #2 limestone outlier - on dip slope.
7/3/57/11 - from top of a limestone in Geol. Canyon. The question is if this is a Gaptank limestone then it would appear the #2 gray member of King's is not present here as much more then rubble at the base of his #4 bed. This is the first limestone going up stream after the creek makes the major swing to the east.

PG. 46
The slope on the rather flat top of the Gray Limestone outlier lines up pretty well with the reefy beds across the Canyon. If there is a fault zone in the lower portion of Geologist's Creek it can't be very great. I personally believe any discordance can be explained as slippage in the shale (Uddenites) zone carrying the Gray Limestone member down. This seems to be the result of a syncline in the upper gaptank beds which in this and the case of p. 26 apparently control the placement of streams. The gray limestone may either thin to the west, or the unit may change lithology and add shale between 2 limestone horizons, paleo will need to be checked. If the #1 bed of Section V is Gaptank and the silty sand would fit nicely as the Uddenites zone. It would seem from the top of the Gray Limestone outlier that bed 4 maintains as fairly constant interval with bed 5 of Section 5. I would put this at about 10-12' or just about the displacement of the little N-S fault.

PG. 47
If the fault up Geologist's Canyon is for real, the collection from 7/3/57/11 should be Gaptank; I suspect however it will be found to be Wolfcampian. If it is Gaptank it can be easiestly explained as a bed truncated by the reefy beds of the #2 gray limestone above and then by the #4 bed of King near the creek beds. At this time it seems significant that the large central part of reefs are contemporaneous and are on or near the top of a Gaptank anticline. The Uddenites zones under the outlier suggests it to could be an anticlinal or at least a high area.
The fossils I found today in the Uddenites zone indicate near shore deposition. The wood in all probably is too cemented to have been carried very far to sea,

the pelcypods are small but of a mud burrowing type judging by the elongate siphonal ends of the interval casts. The gonitites may suggest normal marine salinity but this point will require further checking.
The question of structural warping of the limestone in the outlier of King's Gray Limestone

PG. 48
member, I believe is an illusion. I think that there were two reef heads which filled the area between them by debris from lenticular beds. The nearly flat upper surface with 2 or 3 feet or more beds extending nearby the whole length of the outlier would further suggest this. The collection of fusulines (7/3/57/10) I believe indicate slightly less turbid water (deeper?) giving these shells and smaller shell frags a chance to accumulate in well bedded strata.
Pictures 4 and 5 are of the area of the smaller Gaptank anticline and the slumped #2 gray limestone.
Pictures 6 and 7 are of the lower part of the western W.C. fans in the Hills proper.
July 4, 1957 - Holiday in Marathon!

PG. 49
7/5/57
Section 21

Section VI - about halfway between section V and IV.
1) Limestone gray, massive in 3 to 5' beds, conglomerative on the upper surface, but only slightly. Base of unit not observed.
2) Covered 6' - stream bed.
3) Limestone, yellow-brown weathering, organic frag. (crinoid fusuline) medium size quartz sand on upper surface, well rounded, but not frosted, 2', upper surface is flat. 7/5/57/1
4) Covered 16' - probably a shale interval with at least one perhaps more nodular limestone rubble beds.
5) Limestone, yellow-brown weathering, gray fresh, organic frag. (fusulines, crinoids) replacement quartz in geodes, quartzsand upper surface. The quartz sand seems to have been washed across the limestone and some quartz stuck to the limestone surface - fusulines are bedded in this ss layer. 1'.

PG. 50
6) Covered 5', probably gray shale and limestone rubble.
7) Limestone, brown-gray on fresh surface, orange-brown weathering shell hash of crinoids, fusulines, bryozoans. Progressively finer grained near top. Upper surface is flat. 1'.
7/5/57/2.
8) Shale, black to blue, slightly silty, has slight fetid odor. 35', brown and variate silt zones
1" occasionally - (bentonite?).
{note: illustration:

bed 3: 7/5/57/1
bed 7: 7/5/57/2
bed 8: 7/5/57/3; 7/5/57/4; 7/5/57/5}

PG. 51
9) Covered, 53'.
10) Limestone, yellow-brown weathering, (gray fresh) organic frag. (crinoid) - I'm not sure this unit is not slumped down from above. 3'.
11) Covered, probably shale in great part. A lot of limestone rubble in upper part - 37'.
12) Calcarenite, brown-yellow weathering; some sand (quartz) and upper surface loaded with fusulines, but seem restricted to upper 1". 2.5'.
13) Limestone, rubble for most part, pretty badly covered and it is possible that there are several shale intervals. 26'.
14) Limestone,
a) Calcarenite, brown-yellow weathering; medium sand size through out 2.5 to 3.5
feet; flat top.
b) shale parting 2" to 3", gray shale
c) Limestone, conglomerate at base grading up to coarse sand sizes, organic frag.
Crinoids, brachiopods, corals, bryozoans, 5.5'.

PG. 52
{note: illustration:
bed 16: 7/5/57/9
bed 18: 7/5/57/10
bed 19: 7/5/57/11
bed 22: 7/5/57/12
bed 25: 7/5/57/13
bed 26: 7/9/57/3
bed 27: 7/5/57/14
bed 28: 7/5/57/15

bed 13: 7/5/57/6
bed 14: 7/5/57/7
bed 15: 7/5/57/8; 9/27/57/3}

PG. 53
15) Biohermal nodule - lower few inches maybe shaly and then rubbly limestone, great part is limestone, gray, (weathering - yellow-buff). Corals, brachs, sponges(?), fusulines. 10'.
16) Covered 14' on dip slope of 15+14. 14 (10/99 this seems = 12' to thin).
17) Limestone, fine pebble conglomerate, organic frag. of which fusulines seem to dominate, bryozoan 3', finer grained near top, flat upper surface.

18) a) covered 4', probably gray shale
b) 4" brown weathering calcarenite and sand (quartz)
c) gray shale 6'
d) 2" orange-brown silty calcarenite
e) 6' gray shale
f) 3" bed like b.
g) covered 7', gray shale probably

19) Limestone, orange-brown weathering conglomerate (limestone) in part, pebble to coarse sand in top 6", more yellow and rubbly near bottom 3'. Organic fragmental; quartz sand on upper flat surface, scattered fusulines also.

PG. 54

20) Covered 10' (shale probably)
21) 4" to 8" brown(orangish) calcarenite with quartz
22) 5' covered (shale probably)
23) Limestone, calcarenite medium to fine, progressively to top. The upper 5" are well laminated, flat top, 1'.
24) a) Shale, grayish-brown 3'.
b) 1" brown(reddish) calcarenite and siltstone - well laminated, very fine quartz sand
also.
25) a) shale, gray 5'.
b) 4" calcarenite - some quartz very fine to fine grained
26) a) Shale, gray 4.5'.
b) 6"; like 25b
27) Covered - 30' probably shale and at least 2 calcarenite beds.

PG. 55

28) Calcarenite, rubbly in lower 1.5', organic frags; become progressively better laminated in upper 6", flat top surface. 2', some quartz very fine sand size on top surface.
29) Covered 41', several calcarenites with gray shale probably.
30) calcarenite, organic frag. (brachs, fusulines, crinoids) 10" flat surface is not striking on this bed; wood fragments. Collection 7/5/57/16.
31) Covered 18' - probably gray shale.
32) Marl, silt and clay in matrix and as coarse sand fractions. Has a well laminated upper 2" with flat top. Sort of a transition between influence of source over environment of deposition 21'. Collection 7/5/57/17.
33) Covered 31'.
34) "Hess" Conglomerate 30'+.

PG. 56
7/6/57
Section 19

Section 7 - low hills to west of Wolfcamp Hill. The line of section runs due North.

Covered below
1) Calcarenite, pebbles 1.5" to 2" max, Calcarenite sand matrix and Calcareous cement. Fossiliferous (Crinoids and fusulines), bedding 1' to 1.5'. Flat top 4.5' gray fresh, light yellow-brown weathering.
2) Covered 5.5' probably shale or weakly cemented rubble.
3) Calcarenite, with a few small pebble, fusulines bryozoans and crinoids common. Quartz sands in upper part, 18", flat top. Yellowish-brown weathering.
4) Covered 17', probably shale and 1 or 2 calcarenite beds (less than 4-6" thick).
5) Calcarenite, brown weathering, some quartz sand 8" thick.

PG. 57
{note: illustration:
bed 1: 7/657/1
bed 9: 7/6/57/2; 7/6/57/3, loose}

6) Calcarenite, gray-brown weathering, shell hash, fusulines, crinoids and brachs. Lower part of unit is a shale which grades into a limestone rubble, then into a well sorted frag. limestone. Upper surface is planed flat. Total 5'.
7) Covered 8' - gray shale and some silty calcarenite.
8) Calcarenite - well graded medium sand, a few fusulines (small) and stem joints of crinoids - several beds in a 4' interval.
9) Covered 76'. The lower 20 feet is probably mostly blue-gray shale. The upper 15' probably mostly limestone rubble.

PG. 58
10) Calcarenite, 2" diameter pebbles, some crinoids and bryozoans a few fusulines, brown weathering , gray on fresh surface 4'.
11) a) shale break - 1'.
b) 4-6" well sorted Calcarenite, laminated upper 2", flat upper surface. Total 1.5'.
12) Covered 24' - probably shale (gray) - 1 or more brown calcarenites maybe present.
13) Calcarenite, brown weathering, lower part a shell hash, a shale break and then the well sorted 4-8" calcarenite laminated bed. Total for unit 4.5'.
14) Calcarenite, (limestone rubble) [The main difference between the "so called" rubble and what I've been calling limestone conglomerate or calcarenite seems to be the cementing material. In the "rubbles" the cement is clay and it weathers to a yellow or yellow-brown] gray and mottled brown weathering. 18' in 6-18" beds.

PG. 59
{note: illustration:
bed 14: 7/6/57/4
bed 19: 7/6/57/5}

15) Calcarenite, brown weathering, frags in lower part fine pebble to coarse sand sizes, progressively finer toward top - medium sand size at top. No apparent lamination. 3.5'.
16) Same as 14, rubble, 5.5'.
17) 3" shale break. 1.5' of calcarenite like 15.
18) Like 14, rubble, 4'.
19) Like 10, conglomerate, 1.5' but pebbles 1-1.5" diameter.

PG. 60
20) Mostly covered, 7'; at least 3,4" brown weathering calcarenites, the rest is probably gray shale.
21) Like 19, conglomerate, the upper .5' is well laminated, has some black chert in seams 11 to bedding, 1.5'.
22) Calcarenites and gray shale - 3, 6" to 1' calcarenites, brown weathering. Crinoidal and fusulines fragments, 4 gray shales 1' to 1.5'. Total 11'.
23) Limestone, gray weathering, biohermal reef. 17', upper part is crudely bedded in 2' units lower part is "rubble".
24) a) 2.5' gray shale
b) 0.5' calcarenite, brown weathering (like 15)
25) like 24 a) 1.5' shale
b) 1' calcarenite
26) like 24 a) 6" shale
b) 6" to 2" thins to east, calcarenites

PG. 61
{note: illustration:
bed 22: 7/6/57/6
bed 30: 7/6/57/7}

27) as 24 a) 1.5' shale
b) 8" to 4" calcarenite
28) Calcarenite - lower 1' rubble as 14, but 21' as 15. calcarenite
29) as 24 a) 1.5' shale
b) 2.5' calcarenite
30) as 24 a) 4' shale
b) 6" calcarenite
31) as 24 a) 2' shale
b) 2.5' calcarenite

PG. 62
32) Shale gray, 5.5', 2 calcarenite bands, 2" to 4" thick, fine grained.
33) as 15, 2.5' calcarenite
34) a) shale gray 4" to 8"
b) gray limestone, shell breccia, calcarenite 6" to 1'.
35) 6.5' - like 14 lower 5', like 15 upper 1.5'.
36) Shale gray, mostly covered [4'] <-- 14'?

37) Calcarenite orange-brown upper surface, flat 1'.
38) Mostly covered 2, 4" calcarenite beds at 4' and 10' are exposed. 32'.
39) Calcaredite "rubble" black of gray limestone 6" diameter brown mottled zones with crinoids and fusulines in them. Beds 1' to 3', occasional evidence of the beds being well sorted and laminated at top - 2 observations.

PG. 63
{note: illustration:
bed 38: 7/6/57/8
bed 39: 7/6/57/9}

40) Covered 11' probably less resistant limestone rubble.
41) like 39, 26'. The calcarenite making the top bed in this sequence is well sorted and bedded, well cemented, flat top.
42) Covered 20'. <-- 40'?
43) Calcarudite, well cemented, yellow-brown, 1.5" diameter pebbles, becoming fine grained in upper 3" flat upper surface. 3.5'.
44) 16', lenticular calcarenites. These are interbedded with shales, 50 yards to west I could find only 3 or 4 relatively thin beds.

PG. 64
45) Covered 64'.
46) Gray shale, some interbedded orange and brown sandy siltstone. 53' covered to a large extent.
47) "Hess" Conglomerate. 8', Calcarudite with a large number of dark chert and quartzite pebbles - 4" to 5" diameter.
{note: illustration:
bed 43: 7/6/57/10}

PG. 65
Collection 7/6/57/12 from a yellow weathering conglomerate about 6' below bed 47 - It seems to differ from bed 47 in yellow color and that's about all. 2-3'.
{note: illustration:
bed 46: 7/6/57/11; 7/6/57/12}

The zone of biohermal limestone, #23, seems to carry through pretty well. I believe that #23, section VII, is equivalent to #15, section VI, and to #7, section V.

PG. 66
7/7/57
Big Bend Park.
The first collection is from same horizon as is the John Wilson Eocene Dinosaur exhibit just before reaching park RIQs. 7/7/57/1 (This is only a few 10's of feet above the upper K contact).

7/7/57/2 along Willow-Creek, Terlingua Quad. North 13', west 32'. This is probably Gulfian.
{note: illustration:
bed 1: covered
bed 2: 15', marl
bed 3: 3', clay
bed 4: 35', massive Ss.}

PG. 67
7/9/57
Section 19 cont.

Wolfcamp Hills - Continuation of Section VII.
48) Shale, very silty, grades into a 6" sandy siltstone. Light yellow-brown weathering. 3'.
49) Conglomerate, fine sandy matrix, poorly cemented, 1/2" diameter pebbles - a few 2 to 4" bands of greenish-gray siltstones. 6'. Collection 7/9/57/2.
50) Conglomerate, 3" to 4" cobbles at base of a subunit. The subunits grades into a ledge forming (indurated) fine sandstone. 3 or 4 such subunits observed. Top of each subunit is rather planar. Coarse conglomerate rest right on top of this planar surface. 14'.
51) Shale and siltstone, gray to yellow-brown, 5'.
52) Sandstone, yellow-gray weathering, in 4" to 10" beds with 2" silt partings. 16'.

PG. 68
{note: illustration:
bed 49: 7/9/57/2
bed 53: 7/9/57/1}

PG. 69
53) like #50, 0.5" to 1" pebbles, 5'. This grades laterally into 6' of gray and yellow shale and siltstone. Collection 7/9/57/1.
54) Sandstone and conglomerate 3" to 3' lenticular beds. Conglomerate 2" diameter max. Sand is mostly calcarenite, 10'.
55) Covered 6' - mostly gray to greenish gray siltstone.
56) A multicyclic (?) unit like #50, 3" cobbles 1' to 1.5' per subunit. 9', calcarenite sandstone a very fine to fine size.
57) Sandstone - very silty, and very fine sand size greenish-yellow-brown weathering, 3' rudite ledge 1/2" to 1" pebbles, 4.5'.
58) Calcaredite and calcarenite - 4" to 6" split parting 2' gray to slightly yellow-gray weathering.
59) 57' covered.

PG. 70
60) Metamorphozed limestone, and some baked shale 5'.

61) Rhyolite? sill. Top of Section cont. King Sect. 24?
Collection 7/9/57/3 - from ant hill on small WC knoll, in about horizon of #25 or #26 of section VII.
Collection 7/9/57/4 - dark gray limestone in slope of #2 (Gray Limestone) of King Outlier - SE flank. 1/3 of way up from gate - I doubt if it is in place. {note: illustration:

bed 1: 10', 7/9/57/5
bed 2: 45', 7/9/57/4
bed 3: 60'
bed 4: 25'
bed 5: 45'
bed 6: 20'}

yellow calcaredite, has dark grey limestone cobbles, rusty fine sand and silt matrix.

PG. 71
Section 26

Section 8a - 2.5 miles NE of (Taylor) Neal Ranch House lower part of section badly covered.
1) Sandstone, very fine size, yellow weathering - Tetracorals, brachiopods, sponges?, fusulines?. This bed is fairly porous and most fossils are empty molds. 1' to 2'.
2) Covered 12'.
3) Limestone, gray, shell hash, brachs, crinoids, fusuline 9'. Collection 7/9/57/6, 4" to 1' bedding. At top of unit a bed like #1 is capping.
4) Covered 29'.
5) Limestone, gray at bottom (2') <-- 7/9/57/7, 42' above are gray-brown weathering dolostone no fossils identifiable. 2" to 4' beds.
6) Covered 14'.
7) Dolostone, yellow-brown weathering. 1' to 3' beds, 12'.

PG. 72
Section 8a runs up a small slope. The various angles of bedding and covered intervals between these outcrops are suggestive of some structural disturbance. Section 8b begins on what I believe is bed 7 of 8a.
8) 69' covered.
9) Sandstone, poorly undulated, very fine sand size, some silt, well sorted however, $CaCO_3$ is common as sand grains - greenish-gray shale yellows. 36', 1" to 3" beds.
10) Limestone, nodular uneven bedding, 3" to 6" beds. Collection 7/9/57/10, 3' above base. 38' (See page 21) Collection 7/9/57/11, 15' above base.
11) Siltstone, pebbly, yellow weathering, some bands are more pebble than silt! 15' poorly cemented.
12) Siltstone with pebbles - siliceous cement 2'.

<-- Neal Ranch Fm. <-- Gaptank Fm. (applied to #9-#12)

PG. 73
Section 26

13) Shale and siltstone (10') green-gray colors, 2, 6" welded siltstone (siliceous) near top.
14) Sandstone, very fine to fine-grained, siliceous cement. 2'.
15) Shale 9' green-gray "bumpy", mostly covered.
16) Siltstone with siliceous cement, 6" to 2' beds - 2" to 6" shale on silt partings, buff colored. 11'.
17) Shale (and some siltstone), in beds 6" to 1', siliceous siltstones, in 4" layers 10'. Collection 7/9/57/12.
18) Covered 26'.
19) Siltstone, siliceous buff - [2']
20) Limestone, yellow weathering 3' - brown blotches where there were once fossils, very silty.
21) Covered 16'.

PG. 74
22) Sandstone, pinkish-brown, well and thinning laminated - calcarenite. 6".
23) Covered 30'
24) Silty, brown-orange weathering, dolostone. 4'. It was fossiliferous.
25) Covered [25' +-], above that Coarse Calcarenite. 40' or more.
Brooks Ranch Mbr. Lenox Hills Fm. <--I<-- Neal Ranch Fm.

PG. 75
Section 27
7/10/57

C. Brooks Ranch SW exposures. Also over the fence on to part of the Neal Ranch.
The limestone cliffs on the NE part of the Neal Ranch are lithologically continuous with the interval #3 through #7 of Section 8a. The #9 unit thickens and thins but seems to be fairly continuous throughout. Section 9 (Sect. 27)(dip 7°-10°) (N) {note: illustration:

bed 1: covered
bed 2: 30'; several yellow-brown weathery ledges - would like to call this Uddinites
zone based on color and characteristics of the sandstones; 7/10/57/4
bed 3: 15'; gray limestone - very dark brown; 7/10/57/3
bed 4: 18'; covered; some brown-red shale
bed 5: 23'; biohermal and shell hash, gray; 7/10/57/2
bed 6: very fine sandstone with silt 6" greenish-gray
bed 7: 34'; algal limestone bioherm, gray

bed 8: 4'; covered
bed 9: 6'; gray; 7/10/57/1}

PG. 76
Section 29
Section 10 (dip 10°) (N)
Covered below-float looks like bed #2 section I.
1) Limestone, organic fragmental, crinoids brachiopods weathers light gray with tinge of yellow. 2 rubble zones near base -
a) 14' massive
b) 3' in 1' beds
c) 5' gray and yellow massive
Top Gaptank
2) Covered 7' some gray-shale, probably all is!
3) Sandstone, very calcareous (grains) Fe2O3H2O acting as cement? weathers deep yellow brown. 3'. There are surfaces coated with crinoid frags.
4) Shale gray with few gray siltstones and very fine sandstone grading upward into dominant silt and sand over the shale - unit is essentially gray weathering throughout, becoming slightly yellow near top. 139'.

PG. 77
{note: illustration:
bed 1: 22'; 7/10/57/5
bed 2: 7';
bed 3: 7/10/57/6}

5) Sandstone fine grain, yellow-orange weathering, 3" to 8" beds, even bedding, nearly uniform size and color throughout unit. Total 53' Upper 3' are in 1' beds, paler colors than below.
6) 15' covered.

PG. 78
7) Limestone, gray, rather fine shell hash. Mostly brachiopod fragments recognizable. 8'.
8) 14' covered.
9) Limestone, gray massive, shell hash, 2 beds 6' separated by 6" of limestone rubble. 12.5'.
10) Covered impart - most is a less resistant nodular limestone gray-brown weathering, brachiopod hash. 23'.
11) Limestone, gray massive biohermal 28' (_?_)
12) Covered 5'.
13) Limestone, gray, rubbly at base 2.5' fine hash.
14) Covered - 4'. {note: illustration:

bed 13: 7/10/57/7}

PG. 79
15) Calcarudite, cobbles 4" to 6" diameter, (largest); light brownish-gray weathering limestone matrix. This looks like the "Hess Conglomerate" in the Wolfcamp Hills 15' plus (eroded upper beds).

Colored Picture 24 or 25 - of a "typical" (2) cyclic sequence of Wolfcamp.
1) gray-yellow shale Collection 7/10/57/8
2) silty and full of fusulines
{note: 1 and 2 (2' to 3.5')}
3) limestone rubble 1'
4) calcarenite 8"
5) calcarenite 2'
{note: 4 and 5 (orange-brown weathering)}

This is probably not typical of the Wolfcamp Hills, but seems typical of eastern exposures on Brooks Ranch.

PG. 80
Section 30
Section 11 - Near earth tank 1 mile +-, west of Brooks Ranch, begins at top of Gaptank limestone.
1) Limestone, (Gaptank) (dip 7°N) dark gray weathering, 8' massive upper part contains 1/4" to 1/2" gravels calcaredite only in upper part.
2) Covered 11'.
3) Limestone, shell hash, but not readily identifiable 1' Collection 7/1/57/9 fetid, black on fresh surface, weathers dark gray with spots of iron stain. [Coll 30-3].
4) Sandstone, very limy, light yellow to orange weathering, 6" to 1' beds, 34'.
5) Covered, probably gray shale 27'.
6) Calcarenite, gray weathering, fine sand size, and quite a bit of siliceous silt sizes. 1" to 6" beds, irregular bedding 15'; 7/10/57/10 [Coll. 30-6].
7) Limestone, blue-gray weathering, massive brach frags but very fine grained. 4'.

PG. 81
{note: illustration:
bed 3: 7/10/57/9
bed 6: 7/10/57/10
bed 8: 7/11/57/8}

8) Limestone, light gray to light brown or tan weathering. Beds 2" to 6", uneven or rubbly. Fine grained for most part, (no large frags), several intervals are covered, but seems to be less resistant limestone rubble. 23'.
9) Covered 17'.

10) Limestone, blue-gray, sort of rubble, but almost a calcarudite. Darker "pebbles" are in a lighter matrix, but the difference seems to be one is reticular around the other, not good pebbles. 22', 1" to 8" beds 7/10/57/11. [burrowed??] [weathered??]

PG. 82
{note: illustration:
bed 10: 7/10/57/11
bed 13: 7/10/57/8
bed 17: 7/10/57/12
bed 19: 7/10/57/13}

11) Limestone, light gray weathering, massive, fine grained, 11'.
12) Limestone, shell hash, weathered mottled gray and brown, crinoids, bryozoans, a few brachs, 1/4" to 6" beds. A few inches of shale at the base of this unit. Top of unit has brown weathering color characteristic of the middle an upper Wolfcamp cycles. 15'.
13) Shales in lower part (5' to 7'), becoming more silty and sandy, fusulinid sandstones in upper 2' to 3', 1' shell hash. Collection 7/10/57/8 see note on picture p. 79, 18'.

PG. 83
Between unit 12 and 13 slicken-side surfaces were seen cutting the down dip exposures of bed 12, no major displacement has taken place, but this seem rather to be the adjustment to a slight Post Hess warping forming a gentle syncline near the tank.
14) Calcarenite, yellow to orange-brown weathering quite quartz, rich and might be best considered as a quartz sandstone. 2.5'.
15) Cycle -
a) 4' gray shale
b) 1' like #4 below (at top)
16) Gray shale 9'.
17) Sandstone yellow weathering, 1' beds on less; 16' The fine sandstones have a great deal up to 40 or 50% fusulines, crinoids, gastropods, 7/10/57/12.
18) Covered, probably continuation of 17. [15'?]
19) Limestone, weathers gray to brownish-gray, shell hash, brachs, some fusulines. [12'?] 7/10/57/13.

PG. 84
20) like #19, 7'.
21) Sandstone, very fine high $CaCO_3$ 4' greenish-yellow.
22) like #19, 21'; changes to dolomite along outcrop (100').
Although no Conglomerate beds were found, I believe beds 19-22 are in the same interval as the "Hess" Conglomerate of section 10. [probably a matter of pre-Hess topographic relief.]

The absence of "Conglomerate" bed in the lower Hess in Section 8 and in Section 11 leads me to believe the conglomerate in the Wolfcamp Hills and in section 10 are local lenses and not a good mapping horizon. The light gray limestone at the approximate level of these conglomerates appear to be a fairly consistent outcropping horizon. Without the benefit of fusuline evidence I would at this time suggest the beginning of silty and fine to very fine sandy bed above the highest "cyclic" Wolfcamp in the Wolfcamp Hills seems to be a persistent unit also, although it is often obscured by talus.

PG. 85
The upper beds of the Wolfcamp are apparently missing in the western portion of the Brooks Ranch as a result of erosion. The limestone cliff forming Wolfcamp units is probably equivalent to the #2 gray limestone member of King in the Hills proper. Upper Wolfcamp Cyclic deposits were observed on the Brooks Ranch (to be measured later) and also at section 11.

The Gaptank limestone becomes the prominent cliff (no it doesn't) former in the low - builds east of section 11 because of thinning of the #2 gray member of King and also because of some thickening of that (gaptank) unit to the east. {note: this paragraph was crossed out}

The upper Wolfcamp beds in Sect 11 are in a structural low and show evidence of being deformed slightly prior to Hess limestone deposition.

PG. 86
7/11/57
Section 28

Covered below Section 12; at head of draw northwest of section 10.
1) Limestone, gray, massive beds, 3 to 20' bedding biohermal, rather fine fragments - 51'.
2) Covered 7'.
3) Limestone, gray, uneven bedding near base, more massive higher. Gray weathering. Crinoid stems and fusulines near base. 3'. 7/11/57/1.
4) 1' covered.
5) Calcarenite, yellow-brown weathering, brown-gray on fresh surface. Some fusulines and brach shell fragments - 1.5', 7/11/57/2.
6) Covered 2'.
7) Calcarenite, yellow-brown weathering some mottled grays, coral and crinoid and brachiopod fragments. [1']
8) Covered, gray-brown shale probably, 1.5'.

PG. 87
{note: illustration: Section 12:
bed 3: 7/11/57/1
bed 4: 7/11/57/2 {notes beds4-7: 5.5' total}

beds 8-11: 5' total}

9) Sandstone, fine grained, yellow to gray-brown weathering, 6" (calcareous-quartz).
10) Shale gray, mostly covered 2'.
11) Sandstone, fine grained, orange-brown weathering, calcareous-quartz. 8" to 1'.

PG. 88
12) Shale, brown to gray with 1" to 3" beds of siltstone and sandstone (fine) poorly indurated. 22'.
13) Covered 23'.
14) Sandstone, brown to yellow weathering in 3" to 6" beds, gray on fresh surface. Calcite cement and some calcite grains <30 to 40%. Crossbedding 1/2" to 1" fine to very fine sand well sorted; I believe this to be either eolian or back beach, maybe a little of both. 27'. 7/11/57/3.
15) Covered 18', limestone rubble?
16) Dolostones, 45'+ brown weathering.
Above are undoubted Hess beds of general position and lithology in 19 through 21 of section 8b.

PG. 89
Section 28 contd
{note: illustration:
bed 14: 7/11/57/3}
Really need to work this out on photos!

PG. 90
Section 31

Section 13a - 1/4 mile east of section 11, up front of lower ridge - To top of hill 4752 Section 27 of King.
11) Limestone dark gray, (Gaptank) looks like biohermal rubble - 3" to 4" diameter blacks 5.5' massive 7/11/57/4.
12) Limestone, rubble, dark gray, in 3" beds, very uneven 1.5'
13) Limestone, like #1, upper 3' is 8" to 1' beds, lowers 9' massive, weathers to irregularly pocketed, but rather smooth masses. 7/11/57/5.
14) Sandstone, fine grained weathers orange to yellow-brown, some green color in patches. 3" to 6" beds; 3.5'.
15) Covered, but seems to be a dark red-brown shale zone - This is same color as is at top of Wolfcamp 3/4 mile west. 7/11/57/6, 7'.
16) Calcarudite - all sizes, up to about 2" diameter. Small pieces of Tensus? chert and other cherts, subangular to subround. Upper 1' organic frag. 9'.

PG. 91
{note: illustration: Section 13a:

bed 12: 7/11/57/4
bed 13: 7/11/57/5
bed 15: 7/11/57/6
bed 17: 7/11/57/7
bed 18+: Lenox Hills}

17) Mostly covered, limestone rubble, purples, grays, yellow-browns - 5" to 8" beds. 28'.
7/11/57/7.
18) Calcarudite, cobbles 6" to 10" diameter; mostly limestone cobbles, but a few large chert cobbles and quartzite also. In 3' to 6' beds - cement in limestone weathers yellowish. 45' to top of ridge.

PG. 92
Collection 7/11/57/8 from the zone of #8 and #9 units in section 11. The limestone have changed to calcarudites and appear much thinner. They seem to thin rather than being entirely truncated at section 13. This collection is from a saddle on the northwest side of the Ridge Section 13 is on.
Collection 7/11/57/9 from Gaptank limestone, dark gray (upper most Gaptank limestone) 2 bags, one of softer interbeds, one of dark limestone. The stream gully on Brooks ranch 1 mile west of Ranch House.
Remark - It certainly isn't like P. King mapped it.

PG. 93
Section 31 see King's Sect 27.
7/12/57
Section 13b - Below unit 1 of Section 13, there is an exposure of gray-brown shales and orange sandstones. Whether this is a zone in the gaptank or the illusive Uddenites zone is the major concern. The field evidence to date would suggest to me it is a zone in the Gaptank - (These are vertical distances, dip 10° to the north.)
1) Limestone, dark gray, organic fragmental, mostly brachiopods and crinoids - 25'.
2) Covered 20'.
3) Limestone, yellow weathering, dark gray fresh surface, organic fragmental - see collection 7/12/57/2, 1'.
4) Covered 12'.
5) Limestone, black to dark gray, organic hash, 1.5'.
6) Covered - 28' probably mostly of #5 lithology.

PG. 94
7) Sandstone, light orange-brown weathering, much quartz; cross bedding, sizes not well sorted, probably fluvitih deposition. This unit appears to be truncated to the west by unit #8. 21'; in 6" to 3' beds.
8) Limestone, dark gray, organic fragmental very uneven lower bedding plans, 3' to 5' of relief cut into truncated edges of #7. 11'.

9) Alteration of Calcarenites and brown gray shale, Calcarenites become very fine pebble conglomerate higher in unit; 55' to 60' interval is badly covered.
10) Covered, 40' to base of Section 13a unit #1.

PG. 95
{note: illustration: Section 13b:
bed 8: Collection 7/12/57/3

bed 1: 7/12/57/1
bed 3: 7/12/57/2}

PG. 96
{note: illustration: Conolyn Brooks Ranch: see illustration for notes}

PG. 97
Section 34 (part)

Section 14, 3/8 mile west of C. Brooks Ranch House.
Covered below
1) Sandstone, light orange-brown weathering. $CaCO_3$ cement in part, a few grains of calcite 6" to 2' to 3' beds - 38'. (see unit 7 Section 13b).
2) Shale, gray to brown with 2 beds (1') like #1. 17'.
3) Limestone silty and sandy, but abundant fusulines weathers light tan or yellow. Brach shells also abundant. In 3" to 6" bed, uneven bedding surfaces. 29'. 7/11/57/4 NO!
7/28/58/1 check samples 7/12/57/4
4) Covered, 55': If other side of gully is compared, this interval is a massive calcarenite, gray weathering with indistinct 6" to 6' beds. It caps that ridge but not the one the section climbs. (Fault?)
5) Limestone, gray mottled colors, darker "pebbles?" in a lighter matrix; 1.5' to 3" beds irregular bedding planes 18'.

PG. 98
6) Limestone gray massive, 44' crinoid fragments, brachiopod shells.
7) "Hess" Conglomerate about 10' above this last unit 6. This is on a dip slope so it is difficult to set the interval between the top of #6 and the "Hess" Conglomerate, but it is within the 10'.

Along the front of the central segment of the Brooks Ranch Wolfcamp ridge most of the drains are the result of erosion in the zones of weaknesses caused by faulting. These faults have throws of 10' to 50'. The limestone ledges back of the ridge have several zones of slicken sides which I interpret as movement on bedding planes as the Wolfcamp limestone was arched during later. Marathon basin movement. Probably past K all though I have no direct evidence for the time of movement. The faulting perpendicular to strike cuts the Hess and

Leonard so that it aids in draw forming there also. The remnants of K caps are apparently protected by differential movement on (cont. on page 98)

PG. 99
Section 24 (see pg. 163 of book 2)

Section 14
{note: illustration: Section 14:
bed 3: 7/12/57/4}

cont. from pg. 98
these faults and can be explained in this manner.
The evidence in section 13 suggests that the Gaptank and the Wolfcamp limestones either converged and form a combined mass of limestone, or that the Wolfcamp is lacking. The study of section 14 indicates there is more to this than at first meets the eye. I believe based only on lithology that unit 3 of section 14 is the same unit as #1 of section 13a. The #1 and #2 beds of section 14 are probably the same as bed 7 of 13b. The #8 beds of 13b may

PG. 100
cont. from pg. 99
however be equal to the #3 beds of section 14.
The fusulines may tell us the answers, but if the middle of Section 13b is the Uddenites zone what happens to the Gaptank limestone between section 11 and section 13?; is what I've been calling Gaptank in the western part of the Brooks Ranch really King's #2 limestone member in the W.C.H.s? You know, Charlie this could be confusing.
Another question is what is the red horizon of interval which some places seems to separate the massive Wolfcamp limestone (King #2?) and the "Hess" conglomerate (which is often not a calcarudite at its base). I suggest the upper dolostone in section 11 is equivalent to the conglomerate.
7/13/57 - Went to El Paso to meet John Pope (Harvard '54) (Mich. 56 MS) (Cinci. currently) and his wife.
Charles Marken and Pete Roux left on the 12th for Austin, they were instructors at U.T. field camp, Leary's Ranch.

PG. 101
32
7/16/57

Section 15a - 3/8 miles northeast of road into central valley on Brooks Ranch. (10° dip, N60W).
Gaptank?
1) Limestone, dark brown-gray, very fine x-talline, fusulines, some beds gray to gray-tan. This exposure is one of several small isolated rubble heaps out from foot of cliff. This pile of limestone is not bedded, but appears to be more or less

in place. If the fusulines are Gaptank in age then I believe it is safe to consider this outcrop in place. More than 5'. Collection 7/16/57/1 [Leonard Sch. crassitectoria] 1-64 C.R. check sample??
2) Covered 83'.
3) Shale, light gray (impart covered), 7 or 8-2" to 3" sand and silty sand (Quartz) bands scattered in upper half of unit; 28'. 7/16/57/2.
4) Sandstone, orange-brown weathering, medium quartz sand, with silt fragments of pebble (1/4 to 1/2" diameter) Brachiopods, crinoid stems, goniatites wood fragments. 2'.

PG. 102
5) Shale, gray to bluish or greenish-gray, 4 or 5-1" very fine sandstone bands, 10'.
6) Sandstone, orange-brown weathering, fine quartz sand size with calcareous cement. A few wood fragments. The lower 1' of this unit is light green-gray weathering, sand size is the same, difference seems to be the amount of Iron Oxide with the $CaCO_3$ cement. 8'.
7) Shale, greenish-gray, a few 1/2" of sand of siltstone horizon. (7/16/57/3) 27'.
8) Sandstone, orange-brown weathering, very fine sand size much silt --> 30% brachiopods, wood, crinoid stems, 2 to 3" beds 3'.
9) Like 7 in lower part, gradually, upwards, the lithology of unit 8 becomes dominant, beds 3" to 4" is the sandstone: 46'.
10) Sandstone, light brown weathering, (3' of gradational beds at base to this unit into the blue-gray shale at top of #11. 6" to 2' bedding: 19'.

PG. 103
{note: illustration:
bed 1: 7/16/57/1
bed 3: 7/16/57/2
bed 7: 7/16/57/3
bed 11: 7/16/57/6
bed 12: 7/16/57/4
bed 14: 7/16/57/5}

11) Covered 23', probably blue-gray shale with possibly one limestone bed 8' uneven nodular bedding surfaces. Fusulines, bryozoan, crinoid hash. Collection 7/16/57/6.
12) Limestone, gray weathering, massive beds, blocks weather rounded, (not angular). This unit has wavy bedding surfaces and seems to represent a fore reef accumulation of dumped debris 6" to 8" beds. 7/16/57/4. 32'.
13) Covered 8' probably same as 12.
14) Limestone, light brown weathering, cliff forms 2' to 15' beds, massive weathering as a unit along most of this ridge. 53' to top of ridge.

PG. 104

Section 15b - down dip slope and across draw and up to point which is lithologically similar and on the correct altitude to be bed #14 of Section 15a.
15) Covered 7', gray-green shale for most part.
16) Limestone, gray (light green tint) nodular, wavy bedding 7', 7/16/57/7. The upper 6" to 8" of this unit is now caliche. The caliche becomes less dominant after that. This seems to have been a horizon of higher porosity that either that above or below.
17) Calcarudite, all of about same color, probably biohermal debris deposit - 16' no fossils apparent. 3-5'+ beds - gray weathering, like 12.
18) Covered 10'.
19) Calcarenite + organic fragmental 8" to 3" beds. Crinoid stems and fusulines. 7/16/57/8, 12' weathers pink-brown to reddish brown very uneven bedding.

PG. 105
{note: illustration:
bed 15: 7/16/57/11
bed 16: 7/16/57/7
bed 19: 7/16/57/8
bed 21: 7/16/67/9 and 7/16/57/10}

20) Covered, 16'.
21) "Conglomerate Hess", 7/16/57/9 - a collection of cobbles from lowest exposed bed.
Many shades of Limestone, dark gray or nearly black to light gray, white and black cherts, 7/16/57/10 - fusulines in with the fines of the conglomerate. About 110' thick.

PG. 106
Today picture on page 96 looks like this of we can accept King's age on the #1 bed of my section 10, page 76. {note: illustration on this page}
I believe the Hess Conglomerate is a number of pocket beaches. The dolomite strata probably of Wolfcamp age and exposed to suballuvial weathering.

PG. 107
Section 40
7/17/57
- Allison Ranch Gaptank area -
The manner in which the Gaptank limestone lens is striking. They seem to originate in the "Uddenite" zone and thicken rapidly to the east and then thin to disappearance. I wonder whether this Uddenites zone is even approximately equivalent to that of the "type" area (WCHs)

Section 16, north of highway along Allison-Moore Fence - Due North.

Covered below -

1) Limestone, brown-yellow weathering, organic fragmental - Brachs, bryozoans, crinoids, mollusca, fusulines. Collection 7/17/57/1, 5.5'.
2) Covered 21'.
3) Sandstone, 70% or more Quartz, CaCO3 cement. Brown-orange weathering, medium (1/8" to 1/4") lamellae, even - not irregular; in beds 3" to 1', some beds are composed of many small shell fragments - I interpret this to be a littoral deposit, has whole shells of punctuate brachs. 7/17/57/2. [12'].

PG. 108
4) Covered, (unknown), 2 or 3-6" bands of brown-orange weathering sandstones. Collection 7/17/57/3 from cut hills. 34'.
5) Limestone dark gray weathering, organic fragmental crinoids and Brachs mainly. 7/17/57/4 at 38'. 3" to 2' beds 61'. (Transfer bed?)
6) Covered, 66'.
7) Limestone, dark gray, with large amounts of orange-brown quartz sandstone in between irregular limestone masses. 8', 7/17/57/5.
8) Covered, 13'.
9) Calcarenite and ss., light gray weathering, dark gray on fresh surface 3.5', 2" to 6" beds - 7/17/57/6.
10) Covered 10'.
11) Limestone, weathers orange-brown fresh, brown-dark gray. Shell hash, fusulines, crinoids and brachs. 6" to 1' beds. [4'] 7/17/57/7.
12) Covered, 13'.
PG. 109
{note: illustration:
bed 9: 7/17/57/6
bed 11: 7/17/57/7
bed 15: 7/17/57/8
bed 16: 7/17/57/12

bed 1: 7/17/57/1
bed 3: 7/17/57/2
bed 4: 7/17/57/3
bed 5: 7/17/57/4
bed 7: 7/17/57/5}

13) Sandstone - orange-brown weathering, fine sand size, laminated - see color picture. 6"-8".
14) Covered, 22'.
15) Limestone, medium gray weathering, fine grain Calcarenite, many silicified brachiopods. Collection 7/1/57/8 about 4' above base - crinoids common. 6'.
16) Covered, but probably like #15 - 38' to the east becomes a gray-green shale but looks to be more than the measured 38'. 7/17/57/12.

PG. 110

17) Limestone, gray-brown weathering, platy fragments of shells, mostly [potato chip?] brachs, algal. 1' to 2' beds - overall weathering creamy - 7'.
18) Covered 21'.
19) Limestone, (calcarenite) with some quartz 1--20%, cherty or quartzite pebbles 1% or less; weathers a medium brown-gray, whitish speckles - wavy uneven bedding, 1" to 2' thick; 55'. The upper 40' become very quartzite - about 85-90% $SiO_2$ excluding cement. Becomes poorly cemented upwards.
20) Covered, 45', probably like unit 19, see note on page 112. 8/22/58/7 and 7/17/57/9.
21) Limestone, massive, brownish-gray weathering; [Transfer bed] solutions bedding in 6" to 1' intervals, but not much "true bedding" 31'. Biohermal reef, very light gray on fresh surface, very fine grained, probably mostly recrystallized?
22) Covered, 9'.
23) Limestone, brown-gray weathering, dark gray or fresh surface. Coll. 8/22/58/6.

PG. 111
{note: illustration:
bed 20: 7/17/57/9
bed 21: 7/17/57/10
bed 23: 7/17/57/11}

24) Covered, 20'.
25) Limestone, weathers orange-brown, has brown (Iron stain) chert nodules - 9'.
26) Covered, 36'.
27) Sandstone, quartz grain, medium; Calcareous cement. Brown and green grains, chert and quartzite pebbles (1/4" diameter to 1/2"). Some massive beds, some in 1/4" laminar. 31'.
28) Conglomerate; has some sand in it as 27, just that pebbles become 4" to 8" diameter and up to about 75 to 80% of lithology.
PG. 112
There is almost no limestone in this conglomerate, but it still seems to be the "Hess" conglomerate. In other beds limestone boulders and cobbles are as high as 70%.

#20 In the stream draw, interval 20 is exposed. Calcareous shale and sandstones, rich fusulines free in slope wash. Collection 7/17/57/9. White to light cream weathering. Becomes more Calcareous and grades 2-3' into wavy bedded base to biohermal reef. 35'-40'.

The #4 and #5 limestone of King's Gaptank appear to have beginnings in the "Uddenites" zone just to the west of Gaptank. I find no field evidence which would assign a Wolfcamp age to King's W.C.L.s in this area. It is not until we get above that unit that we find a distinct break in lithology.

PG. 113
7/18/57
East of Texas Highway 51, beds of what I believe are Wolfcampian age (at least lithology) are folded and faulted quite badly. The axis of a syncline strikes N74W from peak of K on NW sides of road up a valley in K on SE side or road.
[Slides read 7-18-57-11.]
7/18/57/1 is from a sandstone in the creek in this syncline. This "syncline" is probably drag resulting from faulting NE of locality 7/18/57/1. 50 yards NE of locality 7/18/57/1, beds are on end; probably another fault, not same one. These structures predate K, although the K is jointed or even faulted (1' through) in this zone of weakness. This little area is very complex - 2 sets of faults; one N74W or so and one N3 to 5°E.

PG. 114
Gaptank locality
Section 17 - This begins in Wolfcamp, concealed fault or faults - Near the base of W.C.. There are
1) A number of chert and quartzite pebble conglomerates and quartz sandstone - 8' orange-brown weathering, Chaetetes and tetracoral parts - 8/24/58/1.
2) Covered and faulted (probably) distance problematical, +/- 20'.
3) Calcarenite, orange-brown weathering, dark gray fresh many fusulines; crinoids, very fine ss matrix. (Collection 7/18/57/2 coarse in slope) 4" to 2' beds, shale partings; 9'.
4) Covered 33', passed one upturned outcrop - marks N74-75°W fault of about 10' throw, south west side up: at 63' the outcrops strikes nearly north south - apparent cut by a fault in that direction, east side. [faults add about 30' to this interval better exposed north of old road].
5) Calcarenite, orange-brown weathering, shell hash 1.5'.
6) Mostly covered - a 6" unit like 5 seems to crop out in middle of unit. [5'].

PG. 115
{note: illustration:
bed 2: 7/18/57/2
bed 5: 7/18/57/3
bed 7: 7/18/57/4}

7) like unit 5, in 3" to 8" beds, 4'. The back of this unit has been faulted off.
8) To the best of my ability I believe I found the same beds as 5, 6, and 7, covered for 13', then
9) Calcarenites, orange weathering with an increasing % of quartz sand, upward; Interbeds of conglomerate quartzite and cherts common but with some limestone, many beds are dominantly limestone 24' - upper part dominantly conglomerate - lower part ss.
10) Covered probably the same as 9.
Collection 7/18/57/5 - P.King Chaetetes limestone at base of Gaptank along old road. (N dip of anticline is type area).

PG. 116
The Kings did not recognize the complicated structure of the Gap Tank area. I believe this #4 and #5 Gaptank limestone are the same bed, faulted into 2 portions. The N75-74°W faults do this, and the N-S faults tend to make the units appear thicker than they are normally.
The conglomerate in the eastern most "upper" Wolfcamp contains Tenus (+-Haymond) and Dimple, the Dimple in very dark limestone, the Tenus and Haymond are quartzite.
The massive limestone member of the Wolfcamp seems to grade laterally into bed 3, section 17, but faulting may make the picture more complicated.
Fossils look like the only answer to the question of just were to place there "upper" Wolfcamp beds in Section 17. The conglomerate would suggest it should all be called Hess, but the lithology is similar to the upper Wolfcamp. The fossils suggest an environment similar to the Uddenites interval. These beds are slightly more coarse than the type section of Wolfcamp, but

PG. 117
we are about 12 miles? away too - There is no typical conglomerate of the Hess before we get into the silty quartz Hess beds here. Problems!
It will pay to investigate the outcrops in the Canyon south of the Allison Ranch. The "Wolfcamp" may be exposed there, but I really wonder!

PG. 118
7/19/57
Mr. Moore wasn't at home (Ranch); lives in Midland.

Decie Ranch
The conglomerate lithology C.O.D. pointed out as Wolfcamp pinch the shale interval out to the southwest. The biohermal horizons Jarvey mentioned near the road, I believe are southwest extensions of the lower Hess ledge. The lower Hess ledge 1/2 mile northeast of the first stop contain "Wolfcamp" lith conglomerate high into the unit. The lower Hess ledge is in beds of 1' to 3' limestone at this southwest locality but the lower beds become massive to the northeast and the upper limestone of this interval gradual thin out within 1.5 miles to the northeast. The conglomerates below look like those {note: illustration followed} within the Hess (lower) ledge. At this southwest locality I believe Jarvis has mistaken the upper Hess ledge for the lower Hess ledge.

PG. 119
Collection 7/19/57/1 - a limestone cobble in the Wolfcamp conglomerate. From a free back, but apparently from lower 1/2 of exposed conglomerate section about halfway between Wind Mill and stop 1.

PG. 120
7/20/57

Decie Ranch southwest end of Lenox hills.
Section 18 -
1) Conglomerate, base of unit concealed. Has a lot of Haymond type pebbles, gray sand matrix, a rather small amount of $CaCO_3$ cement. Not knowing if the dip here is significant, I will level up through the conglomerate beds. This unit is in part covered, but the conglomerates are coarse and are the only outcropping rocks - 55', Cobbles of Conglomerate - Collection 7/20/57/10.
2) Limestone, gray calcarenite, same minor amounts of fragmental cherts, dip about 10° WNW zones within this limestone unit are quite conglomeratic. The chief distinction between this and #2 is limestone sands make up the matrix. The conglomerates peter out in about 7', but very fine pebbles are present in the limestone higher in this unit. Top of unit is very siliceous, well sorted, forms a 1" plate. Bedding below is 1' to 4'; 52'. This unit I believe equal to Lower Hess Ledge.
3) Covered 4'.

PG. 121
{note: illustration:
bed 1: 7/20/57/10
bed 4: 7/20/57/1
bed 9: 7/20/57/9}
4) Siltstones and very fine sandstone - siliceous cement laminar but often irregular texture; siliceous cement is secondary see 7/20/57/1, 11'.
5) Limestone, clastic, with chert pebble 1', thin to northeast thickens to southwest.
6) Like #4, 5'.
7) Like #5, 1.5', thicker to southwest.
8) Like #4, 6'.
9) Limestone, clastic, 3 beds 4" to 8" thick, each with well sorted flat tops, separated by siltstones; 3'. 7/20/57/9.

PG. 122
10) Covered 3'.
11) Limestone, conglomerate, chert and quartzite large pebbles; limestone clastic sand size matrix. 1' to 2' beds; Top is same old flat surface, well sorted, and silicified 1/2" to 1".
12) Covered, 24', probably clastic limestone and conglomerate.
13) Limestone, organic frag., bryozoans, crinoid (stems) brachiopods; 7/20/57/2; 1.5'.
14) Covered, 5'.
15) Limestone, organic frag. 7/20/57/3, rubbly at base, becoming well sorted in upper 6", top 1" is silicified and laminated, top is flat. 2.5'.
16) Covered 5'.
17) Limestone, organic frag and clastic, some small chert granules - a fusuline or so, echinoid spine [2'].
18) 17' covered.

PG. 123
{note: illustration:
bed 13: 7/20/57/2
bed 15: 7/20/57/3
bed 21: 7/20/57/4; 7/20/57/8}

19) Limestone fragmental (organic) and quartz fine sand, crinoid frags and brach shells, become more sandy upwards. 9'.
20) Covered - 6'.
21) Limestone, clastic, gray weathering like the other lower clastic limestone, has flat top with 1" siliceous zone 8" to 1', 7/20/57/4, 5 repeats of this lower lowest lithology (at least) in 8" to 3' beds; 18' near top some chert chips. 7/20/57/8.
22) Sandstone, very fine size, weathers light brown thin but uneven laminae. With 2, 3" limestone of the #21 type. 9'.

PG. 124
23) Limestone, clastic and organic frag. gray weathering with a tinge of brown. 2 cyclic beds one (a) 3'; (b) about 4'. Collection 7/20/57/5. Flat tops are silicified and weather a brown Iron oxide color. 7'.
24) Covered, 14'.
25) Limestone, calcarenite, both clastic and organic frags, weather light gray-brown. 1' to 2' beds. 12'.
26) Covered, 31', probably light brown very fine sandstone or siltstone.
27) Marl? This unit is worth additional study. Massive Rx, no bed except near top in a irregular surface. 2 shades of silty limestone; one light brown one light gray - they occur interlocked with each other - also coarse sand size chert and limestone fragments are twisted and warped through this bed. Several kinds of brach shells, bryozoans, and fusulines. I believe this is a bed of slumped material.

PG. 125
{note: illustration:
bed 23: (a) and (b) 7/20/57/5}

on over steepened Permian near shore deposit, a 3" diameter pebble is starring at me. 1.5'.
28) 7', light brown weathering, very fine sandstone.
29) Limestone, gray (dark) clastic, some 1/4" diameter chert and quartzite, 1/2" red-brown siliceous upper surface. 6".
30) Like #28, 8'.
31) Limestone, light brown to gray-brown weathering; very silty and very fine sand size - an irregular 3" band of very fine pebble. 1/2'.
32) Covered, 13', probably like #28.

PG. 126

33) Siltstone, very limy, light brown to brown-gray weathering.
34) Sandstone and siltstone, sandstones very fine grained grades into a 1' to 1.5' lime rich resistant beds. [8'].
35) Sandstone, very fine grained, light brown weathering up to 1" bedding - 23'.
36) Covered, 5'.
37) Sand as #35 - 8'.
38) Limestone, gray weathering 8", has a little cephalopod in it. 7/20/57/6.
39) Sandstone, very fine grained, light brown weathering 8'.
40) Limestone, Massive, gray weathering, biohermal, Upper Hess Ledge.

PG. 127
{note: illustration:
bed 38: 7/20/57/6
bed 40: 7/20/57/7}

Collection 7/20/57/7 - a piece of float, found at about bed 34 - it is a gray limestone so is either from about #38 or, most likely from #40.
Upperpart, through bed 29, of this section the sequence of lithology is rather cyclic, even the Hess (?) in it upper part shows cyclic deposition but with the change of either source of sediment or of depositional environment. I frankly don't know exactly where to draw the Wolfcamp Conglomerate, the bed #2 limestone I believe is equal to the lower Hess ledge. King calls the lower limestone ledge Hess, and the upper ledge, the first Leonard limestone member. Section 18 thus includes Wolfcamp (part), Hess, and lower Leonard brachs.

PG. 128
7/21/57
Section 19 - up to eastern most cliff forming Wolfcamp Conglomerate - topped by Hess limestone ledge. Decie Ranch.
The lower part of this section is covered and it is jumbled up.
no dip
0) Covered below
1) Sandstones, green-gray weathering, much green silty material, 6", Collection 7/21/57/1.
2) Conglomerate, brown weathering, mostly 1/4" to 1/2" chert pebbles, brown sand, but few crinoid stem fragments, 5', 7/21/57/2; 2" to 6" beds.
3) Covered, 10'.
4) Limestone, medium gray weathering, biohermal, no definite bedding, large cephalopods, crinoid columns, fusuline (very large for Penn., could they be Pm?) brachiopods - 29'.
Collection 7/21/57/3.
(Rained out) {note: illustration:
bed 1: 7/21/57/1
bed 2: 7/21/57/2
bed 4: 7/21/57/3; 7/29/58/1; 7/22/57/1}

PG. 129
7/22/57
5) Limestone, with 30-40% chert (and quartzite) pebbles - gray to gray-brown weathering; a few limestone pebbles. 3' beds, from about middle of unit upwards, large limestone cobbles appear, a few horizons are nearly sandy (coarse); 46'. It should be noted that the upper 2/3 of this unit could probably best be called a conglomerate. The limestone is nearly completely lacking except as cobbles in the upper half. About 5% of less of the upper rock unit is limestone cement.
6) Covered for most part, exposures are conglomerate, chert and quartzite, limestone cement. One big limestone block at 38' (Collection 7/22/57/2) 145' - I'm separating this as a unit only because of the weathering characteristics.
7) Conglomerate, poorly sorted to no sorting, chert, quartzite, limestone pebbles; some small cobbles - lime cement. Mass, cliff forming. Become coarser (small to medium boulders) upwards. 84', 1' to 20' beds.
8) Covered - 65' this is probably the extension to the west of the green-gray shale and calcarenite tongue.

PG. 130
9) Conglomerate, brown and gray weathering. Limestone, chert and quartzite pebbles, brown sands, not sorted; base is covered. 3' or more (7/22/57/3).
10) Calcarenite, dark brown weathering. Zones of pebble (10%) in calcarenite. 2" to 2' beds very irregular channelling in top of bed 10. 22'; has a flat top, siliceous clastics are dominant.
11) Conglomerate, chert, quartzite and limestone; limestone locally dominates to make this a calcarudite but chert and quartzite dominate elsewhere (with 5' horizontally). (7/22/57/4) 35' up predominantly limestone in the upper 10' (>50%) has brachs, bryozoans, crinoid stems and coral, besides the fusulines. I think it could be called near biohermal both in formation and position during Pm. 49'. Brown and dark to medium gray weathering. Has blocks and small lenses of light brown silty which weathers out leaving vuggy appearance.

PG. 131
{note: illustration:
bed 6: 7/22/57/2
bed 9: 7/22/57/3
bed 11: 7/22/57/4; 7/22/57/5
bed 12: 7/22/57/6
bed 19: 7/22/57/7
bed 21: 7/22/57/9
bed 24: 7/22/57/8}

12) Calcarenite, medium gray weathering; has granule size organic fragments, 6'. Collection 7/22/57/6, 2' beds.
13) Partly covered - apparently alterations of brown silt and sandstone and calcarenites. 3 cycles - 6'; 6" to 1' limestone.

Calcarenites in 12 and 13 have flat top brown siliceous stained.

PG. 132
14) Conglomerate, about 6" grading up into a rubble of algal, sponge, a few fusulines which may have been transported, crinoid stems, 6'.
15) Sandstone, light brown 1/16" to 1/2" beds - 7'.
16) Limestone, calcarenite, with organic frag. granule size, 1'.
17) Sandstone brown - 6".
note: here the calcarenite is irregular at its base and rests on eroded and weathered brown sandstone - (apparently the major break in sedimentation?)
18) Like #16, 2'.
19) Limestone, biohermal, gray weathering with brown conglomerate chert pebbles.
7/22/57/7, 6' becomes a calcarenite at the top (2') and a flat top surface with siliceous iron (brown) weathering.

PG. 133
20) Sandstone, brown, like #15 - 4.5'.
21) Limestone, rubble, with chert conglomerate and limestone conglomerate cobbles: grades into a calcarenite (upper 6" to 1') with a flat, siliceous iron stained upper surface. Collection 7/22/57/9, 7.5'.
22) Sandstone, light brown weathering, much coarse calcite sand with the fine quartz sand. 2'.
23) Limestone, massive, brownish-gray weathering chert pebbles, and limestone boulders scattered in this. 15'.
24) Limestone, mostly calcarenite - 4 cycles of rubble through calcarenite to flat top with siliceous Iron stained; 21'; (at top 7/22/57/8) top of ridge.
50' northeast of measured section a chert and quartzite conglomerate has cut a 8' channel in unit #25. This conglomerate appears very much like unit 8 (in the lower part).

PG. 134
The conglomerate intervals 1 through 8, thicken northeast ward toward the old Decie dry hole. This is accomplished by a slight thickening of individual beds in that direction, but also by off lap in what are apparently large channel bedding. {note: illustration followed}

PG. 135
Section 8 -
Wolfcamp over lies Gaptank angular unconformity. Gaptank strike N75W dip 9° NE.
Collection 7/22/57/10 and 7/22/57/11 in Gaptank at this point.
1) Limestone yellow weathering, yellow is from a high % of silt, shot through with Calcite veins 7/22/57/10; 30'; covered below.

2) Limestone, biohermal, dark gray to medium brown, yellow weathering silts, chert pebbles and limestone cobbles, 2 beds, 14' (Collection 7/22/57/11).
3) Conglomerate, brown weathering. Cherts, quartzite and gray limestone, brown sand; This unit laps up side of high (top) in #2 bed and finally covers over the top. Strike N30E, dip NW11°, 29'. {note: illustration followed}

PG. 136
4) Sandstone, brown to gray, siliceous weathers purples, magentas and orange locally, 14'.
5) Conglomerate, brown weathering; has sand of #4, cherts and quartzite (but little or no limestone) medium pebbles; has the dark weather colors of #4 - secondary! replacement, 6" to 4' beds. 74'. Moved SW along bed 5 - 100 yards, to a point opposite creek bed.
6) Sandstone, yellow to yellow brown weathering, 1" to 3" beds, a lot of silt and fine to very fine sand size; quartz, poorly cemented. 6'.
7) Conglomerate, pebbles of chert, quartzite and limestone; light gray-brown sand matrix. 4'.
8) Shale, brown, some gray-blues; a 5" brown weathering sandstone top, total 6'. Collection 7/22/57/12.
9) Conglomerate like 7, 2.5', with 2 interbeds of #8.
10) like #8 with 2 - 3" to 4" conglomerate beds like 7 [8'].

PG. 137
11) Conglomerate, pebbles of chert, quartzite; brown sand matrix; weathers brown to brown-gray, 2 beds, one 2' massive, upper one is 1' flat top of fine sands, 3'. (continued on pg. 143)
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7/25/57 - Van Horn area, Eagle Mts, east side.
Collection 7/25/57/1 - shale zone in Hueco - about lower 1/4 of outcrop - This is James Underwood's Thesis area.
7/25/57/2 Wolfcamp? (Sample 7/25/57/2 of James Underwood U of T). NE end of Wolfcamp hill NE of Eagle Springs Ranch House - was base of hill massive, dark gray limestone.
7.25.57.3 (4 to 6' above 7/25/57/2)

The Hueco? is exposed in several localities here: a) In Page Twiss' area in the Van Horn Mts. the Hueco is a dark dolomite in its entire sequence above the PowWow Conglomerate - 800 to 900 feet. b) In the Eagle Mts. James Underwood's area the Hueco becomes sandy in the lower and upper parts - same dark gray limestone (dolo?) in the middle, 600'?.

PG. 138
The Hueco exposed in Page Twiss' area is a dark fetid dolostone; Echinoid spines and some products of brachs are silicified prior to dolomization, but nearly all other fossils have been dolotimized and either completely lost or lack any structures; just outlines. In the Van Horn Mts. there is about 800-900' of Hueco -

about 40-50' of PowWow Conglomerate and transition zones. It is similar to the basal conglomerate of the Wolfcamp and contains siltstones and sandstone possible of the equivalent to the Uddenites zone, but not the same facies.
In James Underwood's area the Hueco is about 600-700' in the eastern locality (7/25/57/1) and perhaps thicker in the NE locality (7/25/57/2 & 7/25/57/3). These last 2 localities are near the base of the base of the unit but the exact horizon was not determined. There is some structure complications in this area and so more detailed work is needed. The presence of siltstones, shales and sandstones in the first locality suggest the lower 1/3 and upper 1/3 are not normal deep basin deposits like the middle 1/3 but (continued on pg. 139)

PG. 139
7/26/57
Collection 7/26/57/1 from base unit of Igneous rock - above Boquillas limestone (K) - This is a possible freshwater limestone in prevolcanic time. Black Peak east of Wylie Mt.
Collection 7/26/57/2 - South of Van Horn about 15; The 3 sisters, western most peak
{note: illustration:
bed 1: Trachycite
bed 2: 200'; water bedded tuffs
bed 3: 10'; Trachycite
bed 4: 10'; Calcium rich and tuffs; 7/26/57/2
bed 5: Trachycite}
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cont'd from (pg. 138)
but rather are near the margin of the basin, probably the SW side. I've promised Jim to let him know what fusulines are from the second and third localities. In general a measured section in this larger region seems to promise little in the way of fusulines. See: Baker, U of Tex, Bull. 2745 (?). Gielerman, 1953, U.S.G.S.B. 987.

PG. 140
7/27/57
Wolfcamp Hills - showed C. Ellis around area.
Collection 7/27/57/1 - Uddenites zones west side geologist's Canyon in saddle.
Collection 7/27/57/2 - Float, near bed #22, section 4, see page 35.
Collection 7/27/57/3 - see page 52; bed 15, section 6.
Collection 7/27/57/4 - Uddenites zone (biohermal locality) NE of Windmill on main reef.

James Robert (Robby) Moore III, Tex. Co. Research Lab, Houston, Tex. mentioned many of the oil company fellow find the Hess in the western (Lenox) part is equivalent in age to the Wolfcamp in the type area and eastward. Also

that the brachiopods and the fusulines may indicate different eyes in comparison to other areas.
Robby gave me a couple of samples from near Shafter, Tex. He believed of Pm. age. They contain orbituloida and couple of Mollusca of undoubted Upper K age, probably Georgetown.

PG. 141
My theory on the cyclic bedding in the upper Wolfcamp is as follows at the present time:
1) Downwarp of Wolfcampian basin to north Deposition of gray and tan shales and a few siltstones gradually filling edge of basin, but beyond "reef" facies.
2) Biohermal activity encroached on this more or less flat bottom "mud" flat from reef (to south) in a northward direction. This accumulating until wave action takes over control.
3) The wave action sorts and worked the later deposits of the biohermal deposits to reduce grain size, increase relative % of quartz and form laminar bedding in upper inch or so. Bypass was important and represents a considerate time of a lost record. Repeat back to condition 1. {note: illustration followed}.
There is more to this than just this simple diagram. The east west facies change leave room for more questions than I have answers at this time.

PG. 142
7/28/57
trip to Big Bend Park.
Collection 7/28/57/1 - 27 m south of Marathon - Glenn Rose upper marl zone; Orbitolina texana.

7/30/57
Collection 7/30/57/1 - light gray shale beneath freshwater limestone in spur between Calamity and Sheep Cks about 26 miles south of Alpine. See ref. Goldich and Elms (Cl of Tex. Bull?)- They assign Eocene age to this limestone in Pueth tuff sequence. Stop 14 Big Bend Guide Book. Collection 7/30/57/2 - limestone part of freshwater sequence above.

PG. 143
7/31/57
Section 8 (cont) - dip 10°NW.
11) Covered 30', probably gray-brown shale for most part.
12) Calcarenite, greenish and orange-brown weathering, poorly sorted at base, includes dark "light-colored" cherts; very fine green quartz sand, Brach, Crinoid and fusuline frag. The lower part is near a granular or fine pebble conglomerate. Upper 4" becomes well sorted.
Collection 7/31/57. Wood frags. common, bryozoans common. Slightly undulate upper smooth surface (3.5').
13) Covered, 13', probably gray shale.
14) Gray shale, with brown tinge. Collection 7/31/57/2; 5'.

15) Calcarenite, like #12, but conglomerate pebbles larger, 4.5', becomes better sorted (Collection 7/31/57/3) and finer in upper 4" to 5" flat to surface.
16) Covered 11', probably mostly gray shale.

PG. 144
17) Calcarenite, yellow-brown weathering, because well cemented and with siliceous pebbles in upper 5", 1.5', Collection 7/31/57/4 from #17 and loose stuff, probably from shale just above and just below #17.
18) Shale, gray to gray-brown, slightly silty 12'.
19) Calcarenite, yellow-brown weathering; lower 8" are pebbly conglomerate a 1/2" shale break and the upper 4" to 5" are well sorted, evenly laminated quartz sand and calcite sand, fine size. Flat top with an Fe3+ oxide zone of very fine sand sizes. 1'.
20) Shale, brown-gray, 28'. Near top Collection 7/31/57/7. Near base Collection 7/31/57/8.
21) Covered, probably like #20, may have several calcarenite (gray), beds. 26'.
22) Limestone medium gray, with a large % (25-30%) Cobble conglomerate. This might be best called a conglomerate with limestone cement locally. Beds are 2.5' to 5' thick; 18'. Collection 7/31/57/5.

PG. 145
23) Covered 5', less resistant zone of limestone rubble? or finer sand?
24) Limestone, massive, locally conglomerate (quartzite, limestone and chert) medium gray weathering (see 6/24/57/2); upper 3"-4" bed is fine grained, flat topped. 25' Biohermal "Hess limestone" of King. Collection 7/31/57/10..
25) Limestone, rubble, some conglomerate cobbles - lenses of 6" to 3' beds - contains biohermal junk crinoids, bryozoans, large fusulines, brach. Collection 7/31/57/6, 3'-5'. This unit thickens to about 8' to the SW just above the Kinkajew dens - (about 200').

Section 20 continued about 200' to SW above Kinkajew dens - followed at top of bed #24.
25b) Sandstones, light brown-gray grading up into a conglomerate and organic frag. hash. Has a well defined planar top with Iron stains and cement. Tetracorals common, also Productid shell frags.; 8'.

PG. 146
7/31/57 & 8/1/57
26) Covered, 15', one 8" bed of siliceous pebble conglomerate exposed in middle of unit, rest is probably gray shale (?).
27) A series of orange-brown weathering, fine pebble conglomerate, from unsorted at base to well sorted at top, with flat upper surfaces - upper 2" are well cemented with SiO2. Collection 7/31/57/9 at base. Several beds of siliceous very fine sandstone or siltstone, 10'.
28) Shale, dark gray-brown, 3'. Collection 8/1/57/7.

29) Calcarenite, orange-brown, organic frag.; very fine pebble size; crinoid stems, echinoid spines. 6".
30) Shale, medium gray-brown. 2.5'.
31) like the beds in #27 - crinoids and fusulines. 6"-1'.
32) Shale, dark gray, 16'.
33) Calcarenite (with high % of chert pebbles too) grading upwards through calcarenite to quartz sandstone with iron oxide cement. Weathers - Pale yellow-brown to a deep orange-brown at top.

PG. 147
34) Sandstone, weathers light tan to buff. Grades into a siltstone and then into a shale. The fresher shale is dark gray. 9'.
35) Covered 12', probably mostly dark gray shale.
36) Shale, dark gray; and siltstone, weathers light yellow-brown. These two lithologies grade back and forth horizontally as well as vertically, 16'. Collection 8/1/57/6.
37) Calcarenite; dark gray (fetid); weathers a medium yellow-brown. Full of fusulines. Collection 6/24/57/7, 1.5'. Surface silicification of fossils; also the upper surface is flat, well sorted, laminar fine calcarenite with siliceous zones.
38) Siltstone, light yellow-brown weathering; with lenses of calcarenite; rather well sorted but not laminated. 9.5'.
39) Covered. 18'. Collection 8/1/57/5 from a poorly exposed bed in middle - like #40.

PG. 148
40) Calcarenite, light gray-yellow, darker frags of fusulines, algal masses and other fossils. Irregular lenses of tan siltstone in various attitudes to bedding - 3'. 8/1/57/4.
41) Siltstone, finely laminated, yellow light brown weathering. Grades upward into dark gray shales; 29'.
42) Calcarenite; organic frag; brachs, bryozoans, crinoid stems; echinoid spines; fusulines. 1'. 7/26/58/7.
43) Shale and siltstone; some mudstone, weathers tan (light yellow-brown); dark gray on fresh surface. 42'.
44) Sandstone, light brown weathering, mud gray-brown on fresh surface. Has fossil frags in lower part very silty in upper part. 1'.
45) Shale and siltstones, light yellow-brown to medium gray weathering. In upper 2', lenses of organic fragmental limestone appear. 29'.

PG. 149
46) edgewise conglomerate? Limestone, organic frag., medium gray weathering; tetracorals large crinoid stems, brachs, bryozoans. Bottom is irregular, seems to follow cut or eroded top of #45. The top of #46 is smoothly undulatory, siliceous upper 2". 8" to 1' (shows siltstone conglomerate toward drainage).

47) Sandstone, very fine quartz, very silty; light gray-brown weathering, no apparent bedding irregular blotches of varying shades of color. 0-1'.
48) Collection 8/1/57/2. Siltstone, light gray-brown weathering, rests on irregular top of #48, in one location rests directly on #47. Fills the trough so formed evenly and within 1.5' is evenly bedded. 14'.
49) Collection 8/1/57/1. Calcarenite, very fine grained; weathers light bluish-gray. Rich in brownish silt. Has a small coiled cephalopod fauna, see bed 38, sect 17. 2'. (a unit like #51 between the 2 limestone beds of this unit).
50) Covered, 9', probably similar to #49. Light brown, sandstone very silty, poorly cemented.
51) Calcarudite and chert quartzite conglomerate with one or two siltstone beds. 8' light gray weathering except for cherts and quartzite pebbles, some limestone cobbles medium gray.

PG. 150
52) Limestone, organic frag.; light gray weathering Productids, crinoid columns; upper 2" rich in siliceous cement and fossils. 2.5'.
53) Alternation of limestones like #52 and siltstones like #45, at least 4 alternative interval is poorly exposed; siltstones have siliceous bands. 12'.
54) Calcarudite, cobbles 3" to 6" diameter; about 5% or less siliceous rocks in this unit. 8'. This seems to form the base of King's 1st Basal Leonard limestone.
8/1/57/3, float found near bed 43. I believe it has come down from either bed 50 or in the Leonard above.
8/1/57/10 - NE of Section 20, 200 yards, from bed #24 - one light colored black, grayer ones are in matrix of rock.

PG. 151
Afternoon (8/1/57) walked along Wolfcamp interval to the NE about 1 mile. The upper shale of the Wolfcamp is poorly exposed along here and even the basal conglomerate of the Wolfcamp is incompletely exposed.
The Dimple is exposed in a window (?) in the Dugout Ck Thrust sheet. Dimple is the apparent source for much of the lower Wolfcamp conglomerate at this point.
Collection 8/1/57/8. Haymond? is exposed just to the SW of the Dimple; (8/1/57/9)is from sand and siltstone in Haymond. {note: illustration followed}

PG. 152
Collection 8/1/57/11 - This bed is dipping slightly toward the town of Marathon, not a good exposure, but believe this is Gaptank thrust over Haymond onto Dimple.
The diagram on page 151 shows 2 limestones thickening and thinning. This is really caused by a fault - raising the NE side about 60-70' with respect to the SW side. The thickening and thinning of the Hess limestone I'm sure does take places but perhaps not on the order of magnitude pictured on page 151.
The Sullivan Canyon fault cuts the NE end of the Decie (Lenox) Hills. The lower Leonard limestone is dropped on the NE side to a point below the Hess sacchinella reef. The picture is confused by several twisted or rotated fault

blocks, in parallel to main fault system. Just SW of Windmill, in line with the Sullivan Canyon fault, there is evidence of a fault - the NE side has black chert (Tenus or Dimple?) faulted against Wolfcamp? or Gaptank orange-brown sandstone.

PG. 153
The amount of cover NE of the place section 20 was measured obscured the geologic relationships. I believe the conglomerate of the lower Wolfcamp is missing in part and pinches out completely over a couple of Haymond and Dimple (Wolfcampian) hills. The evidence is negative because what I believe is Gaptank sandstone (orange-brown) has no conglomerate cover. The Haymond clays and sandstones are exposed very close to the Hess sacchinella reef and no conglomerate is exposed typical of the lower Wolfcamp.
These faults according to P.King's map line up fairly well with the 3 that flank the north end of Cathedral Mt. He maps the black chert as Ord. Marathon "V" unit. The orange-brown beds as Gaptank. They look much like some of the biohermal masses in the Uddenites zone, however. The Dimples cherts are present in great abundance in the conglomerate (see sample 8/1/57/8) which may represent the lower or basal portion of the Wolfcamp.

PG. 154
Lenox Hills near Sullivan Ranch Road.
P.King has mapped the Hess as being faulted about 50-75' down to NE with one fault. I believe there are several smaller faults parallel to the main one. I will sample from the section below the NE nob, but I believe the Leonard is faulted below the Hess at this point and the Leonard cliff forming limestone caps it. G.A. Cooper in the West Texas Permian guide books, 1957 mentions that it seems to be Leonard.

PG. 155
8/2/57
Section 9
Section 21 - Sullivan Ranch Road at NE end of Lenox Hills. P.King called this interval Wolfcamp, I believe it is probably Hess. 0° dip for measurement.
1) Limestone, medium gray, more or less massive, forms lowest part of slope - 8/2/57/1. The lower 5' of this unit contains chert pebbles (fine) in well defined bedding band. Dev. and Ord. cherts. Upper 1' is orange-brown well sorted; total 34'.
2) Covered, 34'; patches of light brown siltstone and sandstone crop out here and there in this interval but no definite relationships were determined. In the upper 15' several biohermal rubble limestone appear to be present.
3) Medium to dark gray calcarenite; well sorted, upper 1/2" is dark siliceous rich. 1'.
4) Shale and siltstone, light brown 1'.
5) Limestone, gray with a tinge of brown. Biohermal rubble - Crinoid columns 2" or more diameter. 3" to 2' beds - total 3.5'.

PG. 156
6) Covered, 7' probably mostly light brown shales and siltstones.
7) Calcarenite, medium gray to orange-brown. A few small pebbles near base, grades into fine sand near top. Upper 1" to 2" siliceous ferric rich.
8) Covered, 25', this seems to be light brown shale for most part, some siltstones and some very fine sandstones.
9) Limestone, organic frag.; some black chert (Ord?) Crinoid columns, bryozoans and fusulines. 1' to 1.5'. 8/2/57/2.
10) Shale, siltstone and very fine sandstones; light brown weathering. 17'.
11) Covered, 27'.
12) Massive limestone, light gray to light tan weathering. Lower 6'-10' have large limestone cobbles, small amount of fine chert pebbles. Collection 8/2/57/3. 58'. This unit has been dolomitized top of NE most knoll.

PG. 157
Section 22 - NE of Sullivan Ranch Road. Starts between 2 windmills. Gaptank below is badly folded and faulted, chert conglomerate, breccia in the greenish chert, beds of chert below seem well bedded and not excessively broken - Gaptank limestone is present as well as brown sandstones.
1) Conglomerate, much chert pebbles and limestone cobbles. Brown cement or matrix dip is about 15° due N. 20'. Becomes fine upwards, some organic fragmental material comes in. 2'-3' beds. 8/2/57/4.
2) Limestone, medium gray, mostly organic frags., some small chert pebbles. Crinoid stems dominant. Has brownish hue (weathered), Collection 8/2/57/5 about 20' up from base. Collection 8/2/57/6 about 60' up from base - thickness - 78'+ the upper beds dip south about 46 to 60°, I suspect this unit is faulted Leonard, a thin bit of upper Hess is #1 and no lower Hess or Wolfcamp at all. Leonard or Upper Hess resting on Dimple, Haymond Tenus and Cabaous.

PG. 158
In walking over this outcrop as far as the Decie fence line there seems to be no exposure of Pm rocks older than these in section 22. The green-brown silty sands (Haymond?) is in a very tight syncline or overturned anticline which strikes near E-W paralleled with the fault in the Leonard. I believe the displaced rocks are faulted down because I can trace this structure about a quarter of a mile. The Cabonferious breccia zone is quite thick here (40-50') and has an upper surface which appears wave cut. It dips steeply to the N (as much as 55°). This surface has since been distorted and is now cut by many secondary faults. The complete field relationships of these beds are unfortunately concealed. Collection 8/2/57/7 - Blue shale 20' interval below Hess limestone ledge, N45°W of Decie well now windmill.

PG. 159
Collection 8/2/57/8 - Biohermal or Biostromal zone in base of Wolfcamp Conglomerate (G.A. Cooper locality) almost due west of Decie well-windmill.

It would be nice to check the outcrops on the Iron Mt. Ranch that P.King mapped as Wolfcamp. The Leonard Mt. section will have to suffice.
Why should P.King have missed this important structure by the Sullivan Ranch Road? Probably didn't walk over it (?).
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8/3/57
Shipped 138# of rock specimens in 3 sacks, the heavier two were double gunny sacks.

END OF BOOK ONE 1957